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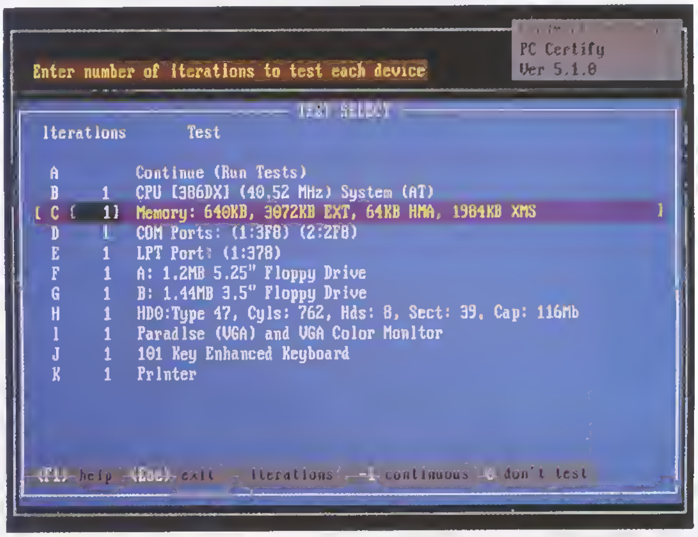

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                                                    PC Certify
Enter number of iterations to test each device      Ver 5.1.0

                       TEST SELECT
  Iterations       Test

   A          Continue (Run Tests)
   B     1    CPU [386DX] (40.52 MHz) System (AT)
 [ C {   1}   Memory: 640KB, 3072KB EXT, 64KB HMA, 1984KB XMS           ]
   D     1    COM Ports: (1:3F8) (2:2F8)
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   G     1    B: 1.44MB 3.5" Floppy Drive
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   I     1    Paradise (VGA) and VGA Color Monitor
   J     1    101 Key Enhanced Keyboard
   K     1    Printer

 (F1) help  (Esc) exit   Iterations  -1 continuous  0 don't test
```

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- Identify system setup problems.
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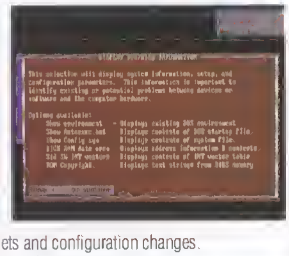

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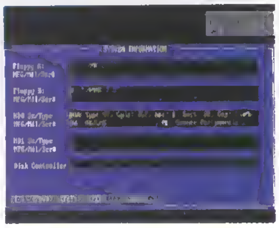

- Displays DOS environment.
- Displays AUTOEXEC.BAT.
- Displays CONFIG.SYS.
- Displays software interrupts.
- Displays BIOS RAM data area.
- Displays ROM copyrights and text strings.

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PC Certify requires 256K of RAM, DOS 3.0 or greater, and is compatible with all IBM PC/XT, AT, 386, 486, or true compatible computers. PC Certify is not a Windows program. It can be run in Windows configured in Standard mode. However, it is imperative that you run any PC diagnostic from DOS or a boot disk and not from within Windows, otherwise you will not be able to fully test your memory and hard disk functions.

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DESKTOP PORTABILITY?

Mitsuba Corporation continues to be a leader in portability technology, with the recent introduction of two NINJA 486SX COLOR notebook computers.

The NINJA 4S25-CP and NINJA 4S25-CA color notebooks offer the power and connectivity of a desktop with the ability to run most word processing, database, graphics, spreadsheet and desktop publishing applications. Upgradeable from 4MB to 20MB of RAM the NINJA has the flexibility to run almost all Windows and high end applications. Mitsuba has also incorporated the highest resolution notebook displays in the industry, giving the most comfortable viewing in portable computing.

Mitsuba's NINJA 4S25-CP is based on Intel's 486SX-25 processor with 8K internal cache. Strategically designed with a 10" sidelit passive matrix 256 COLOR LCD for extremely accurate color images.

Mitsuba's NINJA 4S25-CA is based on Intel's 486SX-25 processor with 8k internal cache, offers the latest design in 8.5" Active Matrix sidelit 256 COLOR LCD. The incredible design of Active Matrix gives virtually each pixel on the display it's own intelligence, making the clarity and brilliance of the color LCD superior to many desktop monitors.

Both the NINJA 4S25-CP and 4S25-CA utilize a built-in 3.5" Floppy disk drive, 79 key full function keyboard with integrated mouse, allowing mouse movement in the tightest of work space. An internal 2400/9600Bd data fax modem for communication in and outside of the work place. The new Mitsuba notebooks are designed with portability in mind. Measuring 8.7" x 11x1.8" and weighing only 6.8 lbs (including battery) the notebooks fit easily into any briefcase making them the ideal corporate companion.

These notebooks come standard with a rechargeable nickel hydride battery for up to 2.5 hours of continuous computing. Which is extended utilizing sleep/stand by mode. Much like Intel's SL technology Mitsuba's 5 stage power management program is actually built into the BIOS. With user definable parameters the power to the hard drive, display, floppy drive, serial, parallel and modem port are automatically shut down for economical energy conservation.

With one of the sturdiest cases available the durable notebooks are complete with standard features like external video port capable of 800 x 600 resolution and simultaneous video, external Floppy disk drive port for a 5.25"FDD, external keyboard port for standard desktop 101 Enhanced keyboards or a portable numeric keypad and an external PS/2 mouse port. Mitsuba being concerned about your investment has also included a docking station option. This allows you to turn the notebook into a desktop computer by simply sliding it into a docking station which has all of your standard desktop peripherals already connected, eliminating the need to buy both a desktop and a portable PC. When leaving the office simply you can take your "PC" with you making the notebook's potential virtually limitless.

We understand that you will come to rely on this portable power. Therefore all Mitsuba notebooks include one year free on-site service provide by 1400 qualified technicians. Dispatched from 400 locations coast to coast, a 98% geographic coverage including Mexico, Puerto Rico and Hawaii, a technician responds to your service calls personally or by phone within 24 hours to minimize any downtime.

Mitsuba has manufactured well engineered desktop systems since 1982, but for the last 6 years has responded to portability market needs with laptops, palmtops, monochrome and color notebooks. All products are subject to stringent quality control procedures maintaining the reliability expected from Mitsuba.

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Cover Design by Peter Rossow,
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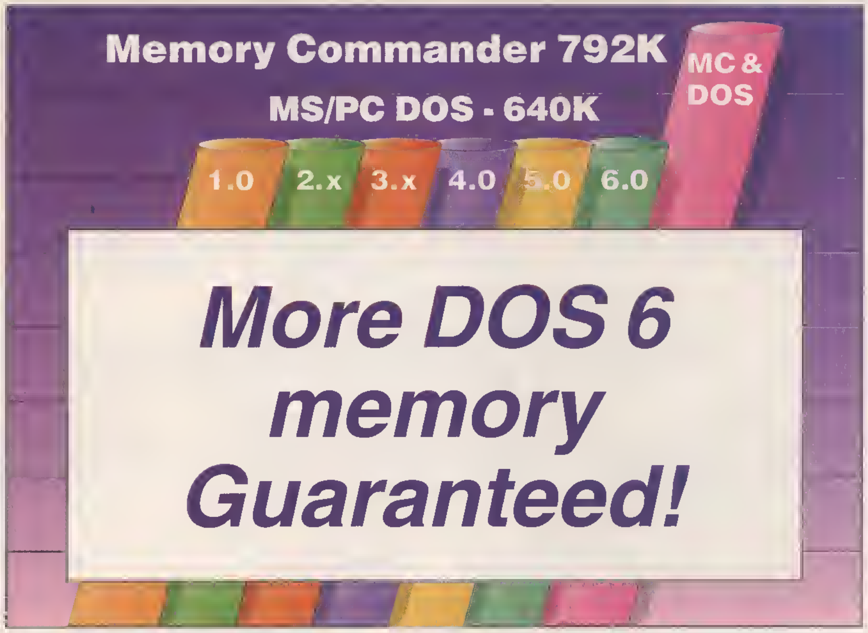
Increase DOS memory



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FROM THE EDITOR

PC UPGRADE WANTS YOU!

We want you to tell us your upgrade story. Start by telling us about the kind of system you started with and what its capabilities and performance were like. Then explain what you did to improve it and what it can do now. We'll feature one or two of the best upgrade stories in each issue. Please enclose a photo of yourself, preferably standing proudly next to your upgraded system.

We want you to tell us about the problems you faced and overcame, the little tricks and workarounds you learned along the way, and what it all cost. We also want to know whose products you used, which ones worked well, and which ones gave you nothing but headaches. We want all the gruesome details. Also, please include any "bonehead" mistakes you made that might help the rest of us avoid same.

Write (address is on the masthead facing this column), fax (to 212-807-8737), or drop a note to our MCI account (*CIP*) or our Compuserve account (70751,3214). Address all correspondence to "True Stories Department."

Be sure to include all of the following information: name of system; microprocessor; name of BIOS; amount of RAM; make, model, and size of hard disk; model of display adapter and how much RAM it holds; type and model of monitor; and any additional add-ons like modems, tape drives, CD-ROM drives, or sound boards that you may have installed.

As many of the editors at PC Upgrade know only too well, real learning takes place when you do it yourself. By sharing your upgrade stories with all of our readers perhaps you can help us all learn a thing or two that we didn't know before.

Ephraim Schwartz

EPHRAIM SCHWARTZ
EDITOR-IN-CHIEF

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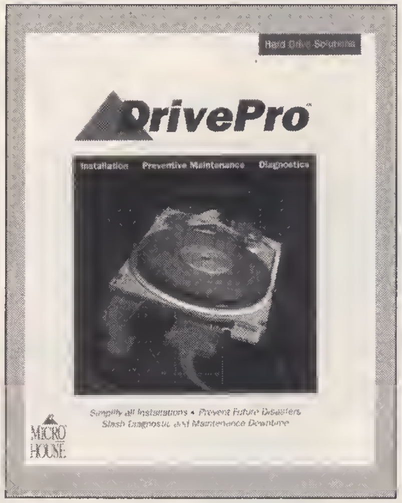
Each month PC Upgrade takes a look at unique software packages to assist end users in configuring and enhancing upgraded systems.

Hard drive installation help, in-depth system diagnosis and improved Windows display.

MicroHouse Drive Pro

The most fortunate computer users never have to concern themselves about the ins and outs of hard disk drives. Their machines arrive with the drive installed, formatted, and loaded with software, and that's the end of it. Some of us, however, are not so lucky. We often find ourselves elbow deep in the guts of our systems, and dealing with hard drive installation and setup. Now, the successful relationship between a hard disk and its host computer depends in great measure on the ability of the computer to accommodate itself to the drive's specifications. But no computer is capable of dealing with every one of the hundreds (if not thousands) of different makes and models that have been offered for sale over the last decade or so. Some systems of course, make a nod in that direction by providing a "user definable" drive type in the CMOS setup, allowing the drive's parameters to be entered manually. Of course, doing so requires knowing the drive's parameters, which isn't always possible when you're working with an unmarked drive with a great price found at the local swap meet.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A solution, thank heaven, is at hand. The good people at MicroHouse (publisher of the Encyclopedia of Hard Drives) have come up with a program, called DrivePro, that vastly simplifies every aspect of hard drive installation and optimization. Indeed, it even eliminates the need to use the various DOS routines—FDISK, SETUP, and FORMAT—to prepare a disk for operation. Meant to be run from a bootable floppy disk, the DrivePro software contains a complete list of hard drives manufactured since 1984. If you can identify the drive, the program will automatically set the computer's CMOS to accommodate it, and then perform a low level format, partition setup, and DOS format. In many cases, even if you can't identify it, the program can retrieve the manufacturer's recommended specifications from the drive itself.

If the computer's drive table cannot accommodate the drive, and doesn't offer a user-definable position, DrivePro's Drive Table Override comes into play. This device driver (which uses no RAM) allows

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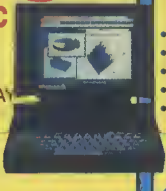

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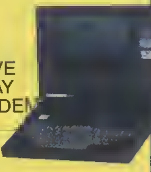

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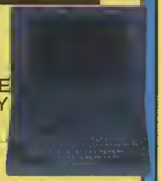

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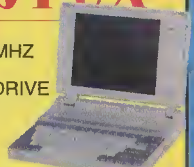

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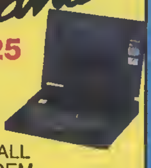

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Price: $99.95; upgrade $49.95
Company: Micro House, 4900 Pearl East Circle, Boulder, CO 80301, 800-926-8299

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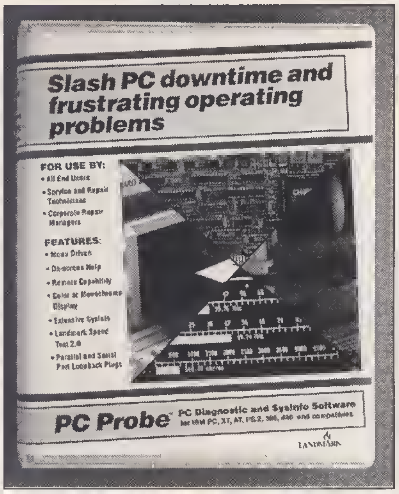
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Intended mainly as a diagnostic tool, Landmark Research International's PC Probe provides exhaustive information about all aspects of a system's configuration, performance, and operation. Its configuration reporting function is similar to that provided by many other programs, including Norton's System Information module and the Microsoft Diagnostics routine that comes with Windows 3.1.

In the area of analysis, however, PC Probe goes into far greater detail than any program we've yet encountered. Loopback plugs are provided for one parallel and two serial ports (one of each size), allowing them to be included in the testing. Any or all of the tests may be run interactively or in batch mode. In the latter instance the routine may be set to run continuously for up to 99 hours, making it unlikely that those pesky intermittent problems will escape detection. Test results may be sent to the screen, to a file, or directly to a printer.

In addition to providing performance and analysis modules, PC Probe is equipped with several utilities of its own. These include an AT CMOS editor, a virus protection program, a routine which determines the optimum interleave factor for the hard drive, a hard disk formatter, and a bad RAM locator. The program's extensive on-line help is augmented by lifetime toll free tech support.

Price: $99; upgrade $30
Company: Landmark Research, 703 Grand Central Street, Clearwater, FL 34616, 800-683-6696.

Artist Graphics Panoramic View

In the Windows arena we're very enthusiastic about Panoramic View from Artist Graphics. Simply stated, Panoramic View expands the Windows desktop beyond the physical size of your monitor, up to a resolution of 32,000 x 32,000 pixels, and allows over 3,300 full-screen applications to be run simultaneously. (Of course, the rest of the system's resources—memory, disk space, etc.—make that a theoretical limit, but you get the idea.) Panoramic View can operate as a single large virtual workspace that scrolls the desktop across the monitor when the mouse is moved to the edge of the screen. Tile and Untile options, in conjunction with a bird's eye view mode, allow the various applications to be arranged on the virtual desktop in any order. It also allows any portion to be zoomed in on directly. The program doesn't store the virtual desktop in system memory, and doesn't use a great deal of free RAM. Indeed, in our tests we didn't notice any speed penalty associated with its use, at least when compared with other means of providing access to several applications. Panoramic view is $50 well spent.

Price: $50
Company: Artist Graphics, 2675 Patton Road, St. Paul, MN 55113, 612-631-7802.

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See page 112

Why Is An IDE Drive Different From All Other Drives?

Q: Thanks for a great magazine. In your Volume Number 1, Issue No. 7, (Page 87), the Hard Disk Dictionary article mentions that "IDE hard drives should not be low-level formatted."

Since a lot of books, articles and software suggest that low-level formatting improves hard disk performance, please explain why IDE drives should not be low-level formatted.

In general, when should a hard drive be low-level formatted? Also, do you recommend changing the interleave factor as a way of improving hard drive performance?

Daniel F. Weisberg
Van Nuys, CA

A: Before you can understand why IDE drives should not be low-level formatted, you first have to understand what low-level formatting does. Though it's a bit of an oversimplification, hard disks generally go through two distinctly different types of formatting procedures before they can be used to store information—low-level formatting, and operating system-level formatting. Each of these operations is designed to accomplish different things. This two-step process is necessary because the hard disk manufacturer has no idea what kind of computer, or which operating system the hard disk will be ultimately used with. And different computers and operating systems store data in very different formats.

The low-level format take a raw hard disk, and actually prepares it magnetically to accept the operating system format. During this process, each spot on the disk is tested to see whether it will reliably keep a magnetic charge, and if not, a table is built on a special area of the disk which the operating system can access to lock out the use of these bad areas. Low-level formatting also creates the cylinder, track, and sector organization of the disk.

A useful analogy to formatting a hard disk might be the building of a road. Low-level formatting can be thought of as the process of creating a roadbed and laying down asphalt.

The operating system-level format, which takes place when you first install the operating system, or, under MS-DOS, when you type FORMAT C:, actually prepares the hard disk to be used under DOS. It initializes the hard disk to the magnetic state that DOS expects, creates the File Allocation Table (FAT), and if specified, creates a boot track that contains operation system files which let the computer load DOS from the hard disk. In our road building example, this could be compared to laying down the lanes, exits, and putting up the signs.

With older hard disks, it was easy to perform a low-level format on a hard disk if it became necessary. The program to accomplish this was contained in the hard disk controller's BIOS, and easily launched using the DOS debug utility. The only downside to performing a low-level format was that you lost any data that was on the disk—irretrievably and forever.

IDE hard drives, however, are a bit different than their predecessors. In order to allow more precise head positioning, which in turn, greatly increases performance, they put a special set of tracks on the disk, called a servo track. This servo track lets the IDE drive's built-in controller tell exactly where the read/write heads of the disk are at any moment, which direction (in or out) they're moving, and exactly when they have arrived at the location necessary for them to read or write data.

The servo tracks are created by special equipment and procedures during a factory low-level format. If you try and low-level format an IDE drive using a utility designed for an

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older drive design, you'll destroy the servo track, rendering the drive unusable. It will then have to be returned to the manufacturer to have these tracks recreated. There are several specialized utilities which allow a low-level format to be done on an IDE drive, and preserve the servo information, but these should be used by qualified technical personnel.

Why would you want to low-level format a drive? Well, there are two major reasons. The first is if you are having a large number of read/write errors on the drive. This usually indicates that the drive is either damaged, or that it's about ready to give up the ghost. Sometimes a low-level format will let you get another couple of months use out of the disk, but it's a good idea to start planning on replacing the unit.

The second reason for performing a low-level format is to reset the interleave. Because a hard disk spins at about 3600 RPM, older drives were unable to access sectors placed sequentially one directly after another. By the time the disk controller finished reading one sector, the second sector (or possibly even the third) had already started passing under the read/write head. Drive designers came up with a method of skipping every two or three sectors before the next logical sector was read. The number of sectors skipped in this method is called the interleave, and is physically coded into the drive structure during a low-level format. Because drive and controller combinations could vary substantially, drive manufacturers were very conservative when setting up the interleave. Performance enthusiasts quickly discovered that many drives could be speeded up by resetting the interleave from 3:1 or 4:1 down to 2:1 or even 1:1. It all depended on the particular drive and controller installed in a particular PC. Many utility packages, like Gibson Research's SpinRite, can test a drive's interleave, and recommend whether or not it needs to be reset.

IDE drives, however, generally have a very small interleave. Almost all of the new ones have a 1:1 interleave (one logical sector physically following another), and even the older units operate at a 2:1 interleave. Rather than trying to reset the interleave on these units to boost performance, you'll be better off using a software utility to cache the disk, or switch to a disk controller that offers a RAM cache.

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The Leader in "Build It Yourself" Computers

The Software Doctor

by David Drucker

Q: I've got a Hewlett-Packard LaserJet Series II, and a Pacific Data Products plug-in cartridge that lets it operate in PostScript mode. Is there a way to switch operating modes without getting up and walking over to the printer, which happens to be (don't ask!) in the next room?

R. Connor
Eugene, OR

A: One of the very nice features about some of the more recent PCL/PostScript printers is their ability to recognize the nature of an incoming document, and automatically switch to the appropriate operating mode. For most users, however, gaining that feature is not a sufficient reason to jettison an other perfectly good printer. This is especially true in your case, for you're in the fortunate position of owning one of the hardware configurations that can benefit from LaserTools' Printer Control Panel. PCP is a 5Kb TSR that intercepts the print job, analyzes its content, and sends commands to the printer that switches it to the appropriate mode. Had you purchased Hewlett-Packard's own PostScript card, you'd be out of luck. Those readers with a similar situation, but different hardware should call LaserTools to determine compatibility. LaserTools, 1250 45th Street, Suite 100, Emeryville, CA 94608, 800-767-8004.

Q: I recently came into a bit of money and decided to stuff my computer with as many add-on cards as it would hold. I bought a fax/modem, a sound board, and a hand scanner, and while everything fits inside the system, nothing works. The system worked fine before I added all the new boards. Any ideas?

Ted Lauder
Honolulu, HI

A: I'd be real surprised if you didn't have a computer full of IRQ and COM port conflicts. What's probably happening is that, in the flush of excitement that inevitably accompanies the purchase of several new toys at once, you neglected to read the portion of each manual that dealt with setting the jumpers and dip switches. You see, for the most part the accessories you added want to talk to the rest of the computer via an exclusive channel. And, very often, they all choose the same channel as their out-of-the-box default. Now, although this sounds like a hardware problem, the path to a solution lies in software you probably already own. If you've got Windows 3.1, the installation process put a program called MSD.EXE in the Windows directory. MSD stands for Microsoft Diagnostics, and what it can do is analyze your system and reveal the status of its various serial ports and hardware interrupts (IRQs).

Here's what to do: remove all three of the new cards, run MSD, and make a note of the COM and IRQ readings. Then, you'll have to install each of the cards — following the instructions regarding the avoidance of conflicts — in turn. As each card is installed, run MSD and note the IRQ (and, possibly, COM) changes. If you're very lucky, the process will be relatively straightforward. It's more likely, though, that you'll have to go through an unbelievably time consuming series of trial-and-error experiments. If that's the case, take notes. Otherwise you'll wind up repeating the same settings several times. This whole process, by the way, is the single strongest argument in favor of buying a plug-and-play multimedia computer.

Q: In general, I'm real pleased with the performance of my 80386/33. The only complaint I have is that it seems to take an age for Windows to load. Is there any way to speed this process up? I switch between Windows and DOS several times a day, and the delays add up.

Albert Shaw
East Lansing, MI

A: Most of what Windows does during its the start up process is pretty much written in stone. You can, however, speed things up dramatically by reducing the number of fonts it has to inventory. With so many applications "throwing in" a library of TrueType fonts, it's very easy to wind up with a library of several hundred of them cluttering up your hard disk and slowing down your system. (Corel Draw 3.0 alone is bundled with more than 250 fonts!) What you want to do is first eliminate the duplicates and near duplicates. Unless you're a professional typographer, there's little reason to keep full sets of, for example, Arial, Avant Garde, Univers, Helvetica, and Gill Sans. One or two sans serif faces should be plenty. Be even more ruthless with the fanciful "headline" fonts. Once you bring the font list down to a more manageable level, Windows should start up much more quickly.

The removal process is very simple, and reversible. From within Windows you open the Control Panel, and run the Fonts routine. It will provide a list of fonts, which can be previewed on screen one at a time. One of the options associated with the list is "remove." You have the option of just removing fonts from the list, or from the disk as well. Removing them from the list makes it simple to reinstall them if they're needed in the future. Indeed, you don't even have to restart Windows to have newly-added TrueType appear in (most) Windows applications.

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7

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And here's a calendar of upcoming computer shows and swap meets.

March, 1993 — May, 1993

Sunday Monday Tuesday Wednesday Thursday Friday Saturday

4 **April 4, 1993**

Ham Radio & Electronics Swap Meet
Las Positas College, Livermore, CA
7am-12pm North off Hwy 580 at Airway Blvd. exit, Follow signs.
(415) 462-5055

MarketPro Computer Shows and Sales
Civic Auditorium, Oxnard, CA
10:00am-5:00pm
-and-
MarketPro Computer Shows and Sales
Centennial Hall, Hayward, CA
10:00am-5:00pm
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18 **April 18, 1993**

MIT Electronics Research Society,
Albany & Main St., Technology Square,
Cambridge, MA. 9:00am-2:00pm
(617) 253-3776

MarketPro Computer Shows and Sales
Sonoma County Fairgrounds, Santa Rosa CA 10:00am-5:00pm
-and-
MarketPro Computer Shows and Sales
Antelope Valley Fairgounds,
Lancaster, CA 10:00am-5:00pm
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25 **April 25, 1993**

MarketPro Computer Shows and Sales
Scottish Rite Center, San Diego, CA
10:00am-5:00pm
-and-
MarketPro Computer Shows and Sales
Cal Expo (Tent), Sacramento, CA
10:00am-5:00pm
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17 **April 17, 1993**

MarketPro Computer Shows and Sales
Solano County Fairgrounds, Vallejo, CA
10:00am-5:00pm
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24 **April 24, 1993**

A.M. Computer Swap Meets
Everett Quality Inn
I-5 & 128th S.E.
Evereet, Washington
Information: (206) 874-8711

15 **May 15, 1993**

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22 **May 22, 1993**

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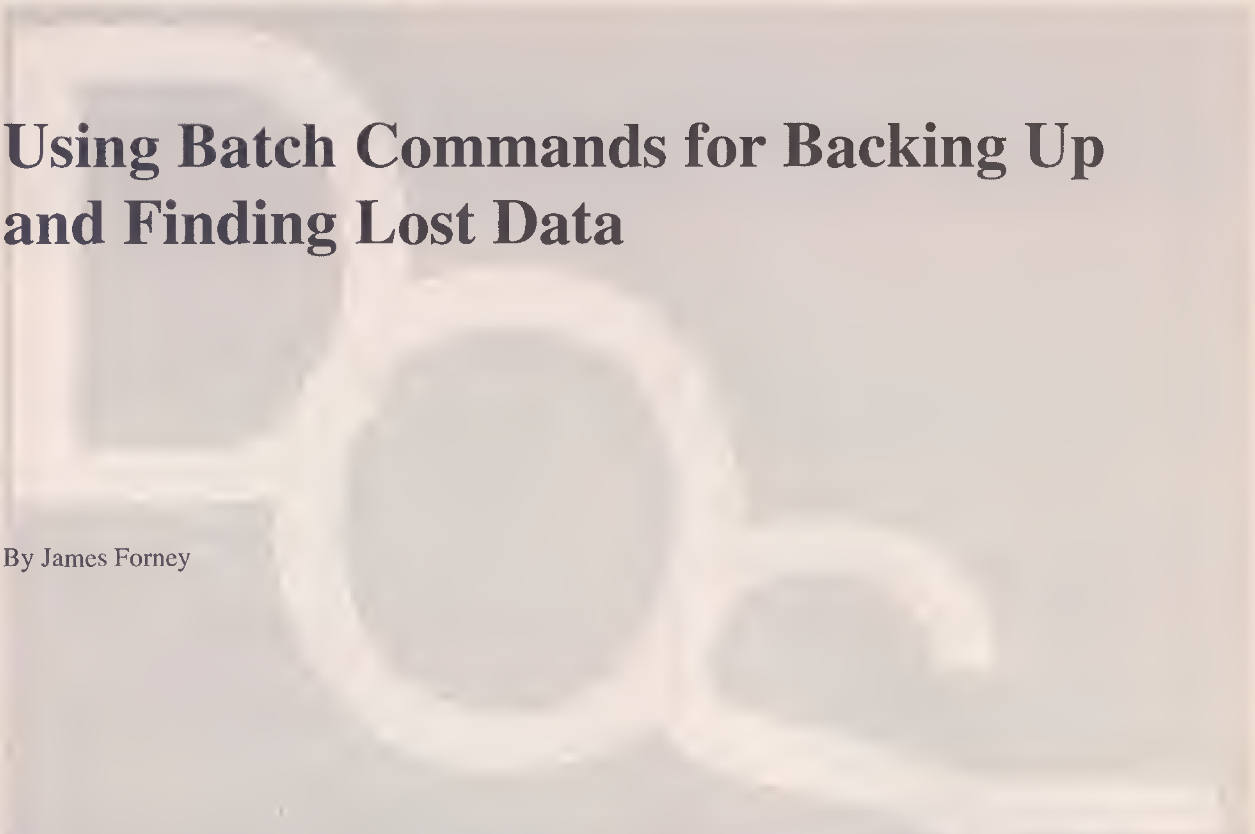

Using Batch Commands for Backing Up and Finding Lost Data

By James Forney

Last month we saw how easy it was to turn even the most complex DOS commands—or whole lists of commands—into batch files that, using some easy-to-remember key word, made the whole process automatic. The batch files we created last time were quite rigid though. This is fine, but often as not there are times it would be nice to be able to modify our batch files 'on the fly' to do things just a little differently.

The secret to flexibility is the ability to pass information throughout batch files to the underlying command(s) at run time. By the way, not only DOS but a number of other DOS-like operating systems or alternative DOS command interpreters such as 4DOS as well as OS/2 provide similar mechanisms for this.

Filling In The Blanks

In MS DOS as well as OS/2 we can pass variables through a batch file by simply referencing a position on the command line starting with the number zero (0) on the left and then counting to the right however far we need to count—provided the entire command line never exceeds 127 characters in length (256 when using 4DOS). For batch file purposes, a variable is generally defined as any continuous string of data with the first blank space DOS encounters marking the end of the string and the beginning of the next (if any).

To tell DOS to look for command line input when a batch file runs we simply insert a percent sign (%) followed by the reference number for a place marker. Last month, for instance, we created a simple one line batch file that would back up all of our new or modified working files to a floppy in drive B using XCOPY like this:

```
copy con: c:\files\batch\daysend.bat
<enter>
xcopy c:\files\*.* b: /s/m   <enter>
^z <enter>
```

In case your memory needs refreshing the /s switch copies sub directories, recreating the directory tree on the target disk if required. The /m switch limits XCOPY to processing only new or modified files (files that have the archive (a) attribute set—something DOS does automatically whenever you save a new or modified file.) If you recall, the name of the batch file was DAYSEND which we put in the C:\FILES \BATCH directory. This was then entered as above.

Suppose we don't always want to use drive B though. Assuming we want to leave everything else the same, all we'd have to do is make this simple change:

```
xcopy c:\files\*.* %1 /s/m
```

%1 tells DOS to look for information on the command line in the number one position. Remember, the count starts at zero, but the zero position on the command line—the first string DOS reads—is always occupied by the command itself, (in this case xcopy). In any other case %1 represents the first variable wherever it appears on the command line.

We called our batch file DAYSEND and in its original form to run it this is what we typed on the command line:

```
C>daysend  <Enter>
```

To run our modified batch file we type:

```
C>daysend a: <Enter>
```

And what DOS sees when it runs `xcopy c:\files\*.* %1 /s/m` now is `xcopy c:\files\*.* a: /s/m`. DOS actually substitutes the data we've just typed at the keyboard—in this case the destination drive—into the command and runs it with this one-time-only data.

Let me stress that this keyboard input is only good for this one time only. If DOS expects a variable and you forget to give it one next time, DOS will tell you:

```
Invalid number of parameters
0 file(s) copied
```

The exact error message(s) you receive will depend on what DOS command(s) you have included in your batch files that need source and target or some other information you have not actually written into you batch file. The mere fact that you have put commands into batch file form does not change the basic syntax requirements for the underlying commands themselves. DOS merely allows you to wait until run time to fill in the spaces.

The basic form for using variables then is:

```
command arg arg  arg etc...
%0        %1 %2  %3 etc...
```

Knowing this, if we really wanted to get carried away we could rewrite our DAYSEND batch file to read

```
xcopy %1 %2 %3
```

in which case DOS would expect us to fill in everything every time we ran the batch file. This would be pretty silly in this case because you would be automating nothing and could as easily run the bare command itself. But the point is DOS would do it.

Let me point out that it is often not only legal but desirable to provide for more variables than are actually needed. For instance, going back to our old DAYSEND batch file, suppose we never needed to change either the source or target but didn't always want to use the /s and /m switches. In that case we could write it this way where any switches we wanted to use would be passed as variables:

```
xcopy c:\files\*.* b: %1
```

We could run this this way for instance:

```
C>daysend /a/w <Enter>

             - or -

C>daysend <Enter>
```

If you look carefully, we've done something here that at first glance may appear to break a basic rule. In the second example, even though we have provided a place marker for a variable at the end of the command we have not given DOS anything to pass. Here it is perfectly acceptable because XCOPY, while absolutely requiring a source and target—information we've provided in the batch file itself here—does not require any switches in order to run. XCOPY without switches doesn't do much—little you can't do with plain old COPY in fact—but it will run, and for our purpose here that's all that matters.

In most cases, somewhere between one and three variables is all you're likely to want or need, but DOS allows 10 (%0 to %9) provided you can fit that many on a 127 character DOS COMMAND.COM line (or whatever line length the command interpreter you're using allows.)

There is a way to exceed that number (if space allows) using SHIFT, a special batch file command, but SHIFT is beyond the scope of this article. It is well documented, however, for those who need it.

Because it is so important, let me reiterate that the number of the variable is determined by how many variables there are. If there is only one variable it will be %1. If there are two variables they will be %1 and %2, but not necessarily in that order. It follows then that this has nothing to do with where the data provided by that variable may be needed within the batch file. Or even in what order.

The New Order

For instance, here's a one-liner I use to ZIP (compress) files to speed modem transmission using PKZIP:

```
pkzip %2 %1
```

Here I've used the second bit of data entered on the command line first, reversing the order of command line input as seen by PKZIP. Why? Because for some reason PKZIP requires that the target be specified before the source—which is the exact opposite of the way source/target information must be specified for most DOS commands. Here it simply provides a means of changing the PK syntax to match that of DOS commands I use.

Nor do all of the parameters passed when executing a batch file even necessarily have to apply to the same line in the batch file. You can easily have something like this:

```
command %2 %3
command %1
```

Note that while you can, in many cases, get by with not inputting data for the last one or more variables you have provided for, you can not in any event fail to provide input to satisfy all variables preceding the last one for which input data is mandatory. Otherwise DOS will mistake the next one it finds for the one(s) you skipped over.

This does not apply to commands like FIND.EXE, one we will be using next whose syntax requires that you put optional entries like switches ahead of the mandatory information.

My Kingdom For A Horse

We will shortly see variables processed in a different order than they are entered on the command line in another, more significant case when we turn FIND, one of DOS's most ineffectual utilities, into the very powerful and useful utility it should be. First, though, we must introduce a command used almost exclusively in batch files: FOR.

With its convoluted syntax, FOR is the kind of cumbersome command that only a batch file aficionado could really love but which, thanks to batch file processing, any DOS user can sometimes use to great advantage. The command is FOR, and as usually documented it looks something like:

```
FOR %%c IN (set) DO command
(in batch file)
```

FOR doesn't really do anything—and yet using FOR can do all sorts of things. FOR does not process: it can not copy, delete or do much of anything else. What it can do is set the stage from which any DOS command (internal or external) can perform its act. It is a looping mechanism that presents one file after another to the active command for processing. We will use that capability in a way that can loop through an entire directory, presenting files one at a time to a DOS command that does not accept wildcards and can therefore only process one file each time it is invoked.

To understand what FOR is doing then, we need to look at the command line as having two halves with the second having nothing to do with the first—in fact the command—whatever command FOR is executing repeatedly—is never aware of FOR's existence. Referring back to the example above, the FOR part of the command is simply:

```
FOR    %c  IN  (%2)
```

(loop) FOR the name of one file from some set of files. That set can either be specified individually—which is usually too clumsy to make FOR worth the effort—or by wildcards. The operative command we invoke with FOR then accepts that filename as it would take any other variable and acts accordingly.

FOR accepts a different kind of variable from those we have been discussing—that of %%c (or %c if run from the command line rather than from within a batch file). This is not like the conventional %0 through %9 variables (they can only be used in batch files) but is a special type.

The letter "c" used here simply indicates a character, generally a letter of the alphabet. The reason for the double percent sign (%%) when run in a batch file is that DOS does not recognize a single percent sign as anything special in a batch file. Two gets DOS's attention—at which point it discards the first one and reads it as "%c" exactly as if you had input the command manually at the DOS prompt.

So now let's look at FIND.EXE, which is usually documented something like this:.

```
FIND [switch(es)] "string" [drive:][path]filename[.ext]
```

What we are most interested in here is the fact that FIND accepts a "string" as an argument. Normally DOS defines a string as an unbroken series of characters—no blank spaces allowed. String, used in conjunction with the FIND command is an exception in that it can include a number of words separated by blank spaces—anything that fits between the two double quotes so long as the total command line does not exceed 127 characters in length (with COMMAND.COM)—as a single "string".

But note that the documentation specifies "filename" meaning only one. In fact, for a long time even Microsoft claimed that FIND could not be used to search an entire directory or subdirectory for matches to an input string. And if it can only search within a single file it's of limited use—particularly with the many excellent third party search utilities that are available.

However by teaming FIND.EXE up with FOR—and occasionally adding another DOS trick or two to the package—we can create a batch file that in only one line makes FIND not only credible but downright powerful and extremely useful for anyone dealing with a lot of text files:

```
for %%c in (%2) do [path]find %1 %%e /n/i %3
```

Which loosely translates to some-

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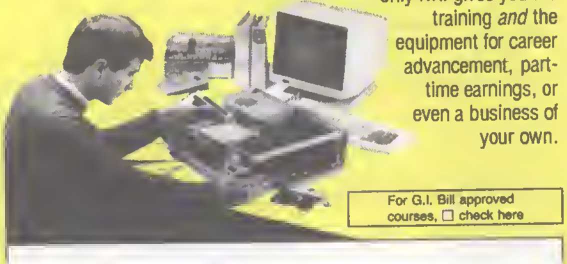

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command %1
```

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thing like:

```
FOR %c (string) IN (%2) DO FIND "%1" %c
```

Confused? Okay, I'll try to break it down a little more. One of the most confusing aspects of the FOR command is that often the purpose of the exercise is really for it to do something IN or TO the file(s) we've specified. Syntactically FOR is correct, since we start off by saying FOR (the value of %c) pick one from (%2). However let's try ignoring the word FOR and substituting IN instead and see if it isn't easier to follow. Now what we're saying to DOS is:

1] In the file the variable %c represents, which
2] is one of the group of files (typically [path]*.*) that is represented by (%2), we want DOS to
3] FIND some "text string" ("%1) somewhere (%%c)

The first half of the FOR command line simply sets the stage for the main event—which in this case is FIND. FOR has to cycle through the list of files represented by (%2) and substitute one filename at a time for %c. FIND doesn't see any of this stage business. It doesn't even see the filename (%c) the first time it appears, so we have to repeat it again where FIND expects to find the name of the source file. After FIND finishes searching the source file presented to it and displays any matches it might have found, control is returned to FOR, which at that point dumps the old %c variable and, assuming there are still more files to process, digs a new out of (%2) to substitute for %c. FIND is then invoked again, and this cycle repeats itself until there are no more files in (%2) to process.

Don't even try to memorize it. This is a classic case of where you simply want to copy down the batch file as we've written it and concentrate on just what values plug in where—which is the whole point of doing batch files in the first place.

In the next file in this group look for "string" in that file.

Suppose, then, that somewhere in those precious files of yours you know you used the expression "my kingdom for a horse". To find out where, in what context and how many times, on the command line, then we would enter something like this:

```
C>FIND "My Kingdom for a horse" c:\myfiles\*.* <Enter>
```

Here, as mentioned earlier, is one of those special FIND "strings" that will accept anything between the two double quotes—even including blank spaces—as a single "string". And typically, the output (assuming only one match is found) is something like this:

```
C:\MYFILES\HORSENSE
[57]The importance of the horse, not only historically but in literature are found even in such well known expressions as "My Kingdom for a horse".
```

Multiple matches, if found in different files, will all be preceded by the name of the file. And any multiple matches within the same file will, as in the case of a single match above (using the /n switch) be preceded by the line number within the file.

And rather than have things go scrolling by to fast to read them off the screen in case of multiple matches—especially likely with a FIND that can search entire directories—the output can be redirected to a file that can be browsed at leisure. We provided for that possibility when we added the %3 place marker in our batch file—which, coming at the end, can either be used or ignored without confusing DOS. To save the output to a file, the command line would look something like this then:

```
C>FIND "My Kingdom for a horse" myfiles\*.* >findtemp
<Enter>
```

And in case you didn't notice, we called our batch file FIND.BAT—the same name as the DOS utility we're using. Contrary to common misconception it is perfectly legal. DOS, it turns out, doesn't care. When you issue a command DOS (COMMAND.COM) looks first (in the default directory and then the path) for any file having a .COM extension that matches the name you've given. If none is found DOS tries again, that time looking only at files with .EXE extensions, and as a last resort makes a third pass looking for a batch file with a name that matches.

The possibilities that batch files offer are endless. In fact as promised at the beginning of this column you can even write batch files that allow you to input data or use preset defaults if you don't. Here, for example, is our old DAYSEND batch file now rewritten in such a way that it will either accept keyboard input (a variable) for the target or use a default we have written in:

```
IF !%1==! XCOPY C:\FILES\*.* B: /S/M
IF NOT !%1==! XCOPY C:\FILES\*.* %1 /S/M
```

To do it, we have introduced another powerful batch file tool, a conditional test that determines how to command will execute. Tune in to the next issue and we'll show you how to add a little logic to your batch files too.

DOS DEBUG

Add Extra Capability to Your Computer System With These Debug-Created Utility Programs

By Jules H. Gilder

As you saw in the last issue, DEBUG is a very powerful program that comes free of charge with every copy of MS-DOS. Armed with DEBUG and a little knowledge about your computer and how it is set up, you can design some really handy little programs to add that extra style and convenience to your computer.*

Add Blank Lines to Your Batch Files

Even if you're not a whiz-bang programmer, chances are pretty good that you've written some batch (.BAT) files to make using your computer easier. One of the pet peeves that most people have about the way batch files are implemented is that there is no way to output a blank line to separate operations or to just make the screen look a little more attractive. DOS' Echo command, which writes information to the screen, does not recognize the space character. Most people wind up printing a period to get the line space.

Using DEBUG, you can easily solve this problem by creating a short program that will output a carriage return and line feed to the video display whenever it is called. I call the program CRLF.COM and the DEBUG script that I use to create it CRLF.SCR.

Remember: Type the following into a text editor.

Step 1 -- Type the word “DEBUG <“ and (the name you're going to give the file.)

For example: DEBUG < CRLF.SCR

Step 2 -- Type in scripts as given in this article.

Step 3 -- Each script is invoked by typing in the first line, example above.

```
N CRLF.COM
A 0100
MOV DX,0109
MOV AH,09
INT 21
INT 20
DB 0A 0D 24

RCX
C
W
Q
```

To refresh your memory, I'll go through a line-by line description of what this program does. The first line uses DEBUG's “N” command to assign a name to the file that is going to be created. Next, the “A” command is issued along with the address in memory (100 in hexadecimal) where the program will be located. The “A” command activates the mini-assembler that is built into DEBUG so that we can create our program code.

To cause a blank line to be printed, we merely have to send a carriage return and line feed to the video screen. We'll stored the hexadecimal codes for these characters at the end of the program, beginning at address 109h. A linefeed is 0Ah and a carriage return is 0Dh.

The PC has many "interrupts" which cause the computer to stop whatever it is doing and immediately do something else. One of these is interrupt 21h (remember the "h" means this is a hexadecimal number) which is a DOS resource that lets you output data to the video screen. Interrupts may have several functions associated with them. Thus is you choose one function you can set the cursor type while another outputs a character to the screen and still another causes the screen to scroll up. For our CRLF program, we simply want to be able to output some characters to the video screen, so we'll use the function that handles that, 09h.

We tell the computer which function of the interrupt we want to use by loading its value into the AH register in the microprocessor. That's what the next line of code does. Once the register is properly set, we can use the INT 21 instruction to execute the interrupt, e.g. stop what the computer is doing, get the data stored at 109h send it to the screen, and then return to our program. Once it returns from performing interrupt 21h, we send it to execute one more interrupt. This one is INT 20, and its function is to return control of the computer back to DOS. Without this, the cursor would never come back and your computer would be frozen.

Following the INT 20 instruction in the program you see a line that reads, DB 0A 0D 24. DB is real 8088 assembly language. Instead, it is a pseudo code, an instruction to DEBUG's assembler. It stands for "define byte" and it tells the assembler that one or more bytes of data will follow.

After the DB we see an 0A and an 0D which we know are the linefeed and carriage return codes. But we also see a 24 code there. This code is the one for a dollar sign ($) and it is needed by the 09h function of DOS's INT 21. It's used as a marker or delimiter to tell the computer where the end of the data we want to send is.

The last four lines of the program issue DEBUG commands. Notice that there is a blank line above the command RCX. LEAVE IT IN!. This blank line is necessary to switch out of the assembler mode and back to DEBUG's command mode. The RCX command displays the contents of the CX register and let's us modify it. We do by entering the hexadecimal number C (it's equal to 12 in decimal). We've just to DEBUG, that when we write the file out to disk, it's only going to be 12 bytes long. We tell it to write (or save) the file to disk by entering DEBUG's "W" command and finally quit DEBUG and return to DOS with the "Q" command.

The program listed above should be typed into a standard ASCII text file with a simple text editor. If you use a word processor, be sure you save the file as an ASCII one with no word processing commands imbedded in it.

I give all of these DEBUG script files, as I call them, an extension of .SCR so I can locate them quickly. After you have the CRLF.SCR text file, you can create the actual machine language file by typing: DEBUG < CRLF.SCR. Make sure that the directory that the DEBUG program is located in—usually your DOS directory—is in your PATH statement.

To use the program, just type the word CRLF on a line by itself in your batch file every time you want to print a blank line. Thus, a sample batch file might look like this:

```
@ECHO OFF
ECHO THIS IS LINE ONE
CRLF
CRLF
CRLF
ECHO THERE SHOULD BE 3 BLANK LINES BETWEEN THIS ONE AND THE ONE ABOVE
```

The first line of this batch file (@ECHO OFF) turns of the DOS function that shows every line in a batch file as it is being executed and lets only the lines the produce some output be seen. If you copy this 6-line batch file and call it TEST.BAT and if CRLF.COM is in the same directory or the PATH, then typing TEST will produce this:

```
THIS IS LINE ONE

THERE SHOULD BE 3 BLANK
LINES BETWEEN THIS ONE AND
THE ONE ABOVE
```

Print Out That Last Page

Did you ever print a screen out from your computer display only to find that you have to press the printer's form feed button in order to eject the page? Or maybe you printed out a document by "copying" it to the printer and the last page once again wasn't ejected. You can solve these problems with a simple program called FF.COM, whose only purpose in life is to send a form feed command to the printer and eject one page.

FF.COM is similar to CRLF.COM in that it also uses interrupt 21, except this time, it uses function 5h which outputs data to the printer connected to LPT1. If you want to use other parallel printer ports BIOS printer I/O functions associated with interrupt 17h are used.

```
N FF.COM
A 100
MOV DL,C
MOV AH,5
INT 21
INT 20

RCX
8
```

```
W
Q
```

As you can see from the short listing above, the program is very simple. The form feed command "C" is loaded into the DL register to be printed and the number of the function to be used with the interrupt (5) is loaded into the AH register. Interrupt 21 is executed, a form feed is sent to the printer and control is returned to DOS. Save the above listing as FF.SCR and create the program file by typing: DEBUG < FF.SCR.

Make Your Cursor Easier to See

Ever lose your cursor on a screenful of text? Do you need to wear your eye glasses to see the cursor? If so, here's a short program that will let you replace the small underline cursor with a big, easy-to-see block cursor.

```
N BIGCURSR.COM
A 100
MOV CL,0C
MOV CH,01
MOV AH,01
INT 10
XOR AX,AX
INT 20

RCX
C
W
Q
```

This program uses INT 10, function one. The cursor data is contained in the first three lines after the A 100 statement. The first loads in the ending line number of the cursor (these refer to the lines in the dot matrix that makes up each character) the second loads in the starting line number and the third specifies the interrupt function that is to be used which in this case is 1, set cursor type. With all the data set, interrupt 10h is executed and control is returned to the program where the XOR statement is used to zero the AX register. The program then returns to DOS.

Type the above listing in as BIGCURSR.SCR and create the machine language program by typing DEBUG < BIGCURSR.SCR.

You can create a program that will restore your cursor to its original shape by using the same program listing as above and simply changing two numbers, the cursor start and end lines.

```
N REGCURSR.COM
A 100
MOV CL,0D
MOV CH,0C
MOV AH,01
INT 10
XOR AX,AX
INT 20

RCX
C
W
Q
```

I've called this program REGCURSR and have changed the value in CL from 1 to Dh and the value in CH from Ch to Dh.

Swap Your Serial Printer Ports

Last time I gave a program that you could use to swap parallel printer ports LPT1 and LPT2. This time I'm going to give you a similar program to swap serial printer ports. The basic program swaps COM1 and COM2, but I'll tell you how to swap COM3 and COM4 as well.

This program works exactly the same way the SWAPLPT.COM program worked last time, except we've used the COM port addresses instead of the LPT port addresses.

```
N SWAPCOM.COM
A 0100
MOV AX,40
MOV DS,AX
MOV BX,[0]
MOV CX,[1] MOV [0],CX
MOV [1],BX
INT 20

RCX
17
W
Q
```

The first thing the program does is define the memory segment (40h) in use. Then the contents of location 0 and 1 are loaded into the BX register. These locations are where the address of COM1 is located. Next the address of COM2, which is located in memory locations 2 and 3, is loaded into the CX register. The data in the CX register is then stored at locations 0 and 1 and the BX register is stored at 2 and 3, effectively swapping the two ports. If you want to use COM3 or COM4 then use the numbers 2 and 3 respectively. That's all there is to it. ■

Write to *Putting DOS 5.0 to Work,* authors James Forney or Jules Gilder, if you would like to see a special Batch Command or DEBUG script created or if you have any of your own Batch Commands or DEBUG scripts to share with our readers. We'll publish the best of them and send you the next issue free.

---

* All DEBUG commands consist of a single letter. When the command is entered it can be in upper or lower case. DEBUG doesn't care. Almost all commands can use optional parameters.

Fans On Cards

If you're upgrading your system with a new, high-speed 80486 microprocessor adding a second fan is a prudent addition to the budget. It will put a stop to many of the unexplained intermittent errors that plague overheated systems.

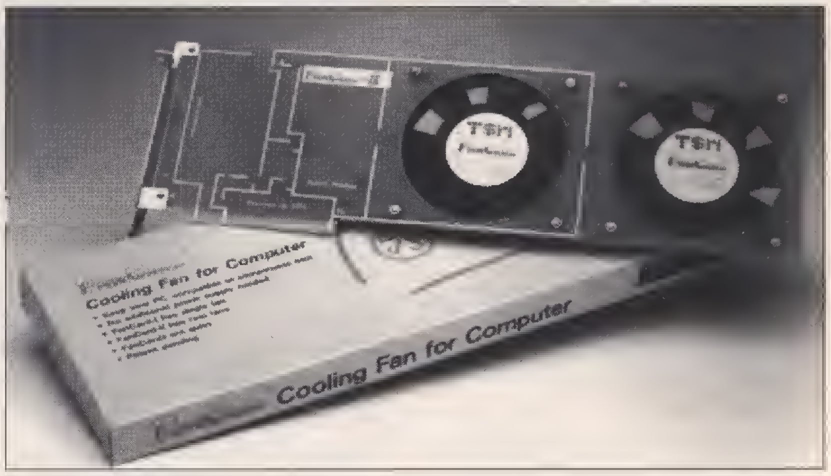
by Zane Binder

From the outside they don't look like components that could save your system. A few resistors, three strands of wire, and two large, flat fans certainly aren't imposing. But their beauty lies in functionality, not outward appearance.

"They keep your CPU cool," said Stan Monach of TMC Co. "With all the accessory boards being crammed into systems these days the heat load can just be enormous."

Monach's Glendale, CA., firm manufactures card fans, either one or two small, low current draw units mounted on a conventional computer expansion slot board. They draw power directly from the computer, and at just over 30 decibels contribute little distracting noise.

"Chips get hot, and so do the other components, Monach said. "The fans keep them cool, or I should say cooler. The power supply fan in many systems only keeps the power supply cool with little or no capacity remaining for the rest of the system."



Chip performance and speed degrades as heat climbs, and in some cases processing becomes unstable enough to cause mysterious system crashes. Heat also drastically shortens chip life.

Two card fans were examined for this article, Monach's TMC dual-fan unit and TSM of Torrance, CA.'s similar Fancard II. Both simply plugged into an open eight or 16-bit expansion slot and immediately went to work, moving lots of air. Whatever brand you choose get the dual rather than single-fan units; one moves air upward, the other down. Beware, too, the fan's placement inside your CPU can be critical. Be prepared to rearrange your expansion cards to get optimum circulation. Without thought as to where they're placed within the case, fan cards aren't very useful!

The cards themselves were both extremely well made. Judicious tugs at the wiring indicated secure soldering, all card traces were well done, and quality control appeared flawless. The fan's rated life for both units is 30,000 hours.

Electrically the fans make few demands on system resources. They draw about two-tenths of an ampere and less than 2.5 watts. As most systems have 200-watt or better power supplies, current usage isn't likely to be an issue.

The units vary between $49.95 and $69.95.

Technical Specifications for the FanCard from TSM

Rated Voltage	12 Volts
Rated Current	200 mA
Rated Input	2.4 Watts
Maximum Air Volume	20 CFM
Noise (at 3 feet)	32 dB
Life Expectancy	30,000 hours
Bus	8, 16, or 32 bit

Companies Featured

TMC Co.
2062 E. Chevy Chase Drive,
Glendale, CA., 91206.
800-832-FANS

TSM
20818 Higgins Court
Torrance, CA., 90501;
310-787-1640 or fax 213-787-1647.

Star Gate One Slot

The days of needing one parallel and one serial port on your PC are long gone. Now you need serial and parallel ports for mice, Miracle Pianos, modems, second printers, specialized printers plus external backup and hard drives. Here's one solution that may be just right for you.

If you're rapidly running out of spots to plug in your computer's peripherals, Star Gate Technologies' One Slot may be your solution. It's an innovative four serial port (COM1 to COM4) and three Centronics parallel port (LPT1 to LPT3) board that provides an external hook-up for fax/modems, CD ROM controllers, network cards, tape backups, printers, or whatever accessory needs connecting. Its electronic innards occupy only a single slot inside your computer's CPU, too, a plus.

According to Ray Wymer, Star Gate's director of research and development, many, perhaps most, CPU expansion slots are needed to support such common accessories as sound cards, network boards, hard cards, and a plethora of others.

"There's just not enough slots remaining for today's power-hungry applications," Wymer said, adding Star Gate's product is the answer to these demands. One Slot's serial ports utilize powerful communications chips which enable it to support high-speed modems and be programmable, too. Star Gate's Centronics port specifications are standard throughout the industry, and the unit is compatible with both ISA (Industry Standard Architecture) and EISA (extended specification) computers.

The board itself simply snaps into your CPU, with the One Slot locatable anywhere within four feet, its cable length. No software drivers are normally employed (more on this later), but in most cases changes must be made to your Windows INI, OS/2, and Config.Sys files. If you want to use your CPU's serial ports in addition to One Slot's, a software driver provided by the company or downloadable from their bulletin board must be employed. Two DIP switches and two jumpers must also be set to use One Slot. The manual is fairly clear overall, but if you're a non-technical type you may need assistance. One Slot uses numerous IRQ's; though no problems were experienced in testing with a 386 SX20, others may not be so fortunate and may have to fiddle with its adjustments.

For $449 (street price, $225) the One Slot is a bargain and problem-solver. The use of specialized changing cables can mitigate serial/parallel port gender problems, too.

Price: $449
Company: Star Gate, 29300 Aurora, Solon, Ohio 44139
800-782-7428
Fax 216-349-1978.

VCR/Tape Back-Up from Alpha Microsystems

Here's a low-cost solution to your backup worries.

by Zane Binder

The idea is intriguing: your VCR employs recording tape, so why can't you use it as a back-up device for your hard drive? It would eliminate those endless, floppy-shuffling backups, you wouldn't have to sit there during the entire tedious process, and there would be no need to buy yet another computer accessory. Well, someone has invented a way to do it, a way that costs just under $200 for about 100 megabytes of capacity. But as novel, innovative, and useful as the VCR/Tape Back-up system by Alpha Microsystems of Santa Ana, CA., is, there are definite limitations. Falling prices on stardard tape backup systems are making the Alpha Microsystems device less attractive. However, prices for a video tape are still at least 50% lower. If you're able to adapt, though, you'll find it fairly convenient, definitely more economical than standard tape back-ups, and once you learn the software and manual, relatively simple.

The system is called Videotrax, and it works equally well with either VHS or BETA formats (used BETA machines are available for pennies). The hardware consists of a half-length electronics board that fits in any PC expansion slot; ordinarily you won't need to change IRQ or on-board jumper settings. Not supplied with Videotrax, however, is the cable necessary to link your VCR to the computer. They're common video dubbing cables that can be found at any Radio Shack for $4.95 a pair. Actually, you'll only need one.

A driver program on floppy disc is supplied in both 3.5-inch and 5.25-inch formats; it installs easily but won't work with the Stacker data compression program or any other compressed had disk.

From here on it's just a question of figuring out the fairly well written 100+ page manual, calling up the various menus (DOS 2.1 and 256K are required), setting your VCR, and allowing the Alpha Microsystems expansion board to convert the computer's electronic signals to television (NTSC) format.

It's here that another Videotrax limitation makes itself known. The data copy rate from your PC to VCR averages about a minute and 20 seconds per megabyte, slightly more at restoration time (the author's hard disc restored flawlessly). That means a 40-megabyte hard drive takes about an hour, but you don't need to be there to shuffle floppies. This is between five and 10 percent of the data transfer of standard tape drives.

According to Mike Luirette, Alpha's vice president of marketing and administration, Videotrax's data transfer speed is governed by the VCR's.

"There's no way to speed that up," he said, "but there's a compensating factor you don't get with standard tape back-ups: data security". Videotrax lays down four separate copies of your data on the tape and you can increase that to 20, meaning garbles will be minimal. With Videotrax, you can use it before you go to bed at night or leave the office.

Standard VCR tapes of any length can be used (according to the number of megabytes to be transferred), and Videotrax's driver software is written so you have the choice of backing up or excluding specific directories, bypassing certain files (such as that multi-megabyte permanent Windows swap file), verifying a tape's integrity before use, and performing numerous other sophisticated operations.

If you run into trouble (unlikely), there's even a toll-free technical support line (800-548-4848). Should you have hardware troubles during the year warranty period, manufacturer Alpha Microsystems even pays for Federal Express to ship the product back!

Alpha Microsystems
3511 Sunflower
Santa Ana, CA., 92704
(800) 253-3434
System Requirements: 386-25 DX/SX or slower. Video trax will not run with a faster system.

5 STEPS TO GIVING THE GIFT OF A USED PC

Shopping for a present for the "person who has everything"? Odds are three to four they don't have a personal computer.

Okay, so a new PC makes an expensive gift, but who says you have to buy a new one? It turns out that old, forgotten computers make great gifts for the children, college students, mothers returning to work, and retirees.

Even if you don't have an old PC laying around unused, you may want to consider buying a used machine from someone else, cleaning it up, and giving that as a present. Used PCs are available most anywhere. See the Swapmeet Calendar in this issue. Look around and you could get lucky. The $100 and $200 deals are out there, but it'll take asome effort on your part to uproot them.

Here are five steps to successful used computer gift-giving.

1. **Clean 'Em Up & Check 'Em Out.** It would hardly do to give a dusty old PC as a Christmas present, so be sure the blasted machine is clean and works before you wrap it up. Use a multi-purpose cleaner to remove old dirt and grime. Pay particular attention to the keyboard, which often receives the most abuse. Consider replacing the keyboard if it's worn out or particularly dirty. New ones cost about $30 to $40. Do the same if the case if overly worn. New cases cost about $50.

2. **Give the Computer the "Burn-In Test."** Keep the computer turned on for about a day or so, and note any problems that pop up. It's a good bet that if the computer continues to work after being "burned in" for one day, it'll last quite a long time. And if you have one, use a diagnostic utility to check out the innards of the computer. A program like Check-It, Norton Utilities, or PC Tools are choices. Make sure the diagnostic program recognizes all the options installed on the computer. If you have 640K of memory installed, but the program only reports 512K, you know something is wrong. If you're not comfortable cleaning and troubleshooting a computer, take it to a repair shop. The cost for a routine cleaning is about $50.

3. **Adding Bells and Whistles.** Old computers lack the niceties of today's models. Especially if you're fixing up an old computer of your own, you may want to add some goodies to the PC to make the gift a little more tantalizing. For instance, for about $250 you can add a 30 or 40 megabyte hard drive. Be sure to get a hard drive that is compatible with your computer. Older models are picky about newer drive technologies.

4. **Software Makes the World Go 'Round.** You may also want to think about throwing in some software. Educational programs are a useful and inexpensive purchase. While business-level software can be expensive — with packages ranging from $200 to $700 — you'd be surprised at the wealth of excellent programs available in the $10 to $50 range. Most software stores, like Software Etc., Egghead, and CompUSA, carry a large stock of these inexpensive programs. You'll find something in just about every software category

5. **Don't Forget the Manuals.** If you're the organized type, you'll probably still have the manuals for your old computer. You'll want to include these in the package, because more often than not, you will be giving a computer to someone who has never used one before. To augment the manuals — which are often terribly written anyway — consider throwing in a good introductory book on PCs. A number are available and cover basic models starting from the first IBM PC introduced in 1981. Good titles include *The First Book of Personal Computers* (Sams) and *DOS for Dummies* (IDG Books).

The ALL DX 486 — a 10 Minute Upgrade

For under $400 you can have almost all of the performance benefits of a 486 system, and what you don't get you may not need. Here's how to upgrade your obsolete 80286 system.

An idea whose time has come — and gone — and come again perhaps: the so-called accelerator card that swaps a hotter, faster CPU chip for the one your system came with. All Computer Company, the Toronto (Canada) people that breathed life into thousands of 80286 machines with their ChargeCard (1987) have used the experience gained in that endeavor to bring 486 performance to virtually any lesser machine from a 286 on up.

The one we tested was the 25 Mhz ALL DX 486 for upgrading 286 systems which we installed in an old 12Mhz machine of dubious parentage. Priced at $499.00 (list) but discounted by as much as $100.00 by various mail order sources, the upgrade card is pricey in the face of steadily falling prices for full 486 replacement motherboards. However the ease of installation is a major selling point. And the results of our benchmarks show that the performance is there.

Performance

Putting the upgraded system through its paces with the CBG&H benchmarking routines—routines that include a variety of database, spreadsheet and word processing functions—the computer showed an improvement of as much as 330% over the base machine. In most categories results were somewhat less spectacular, but generally averaged out at about 150% faster.

The ALL DX 486 system requires no expansion slot, consisting only of a credit card-sized circuit board that plugs in where your old CPU chip resided. This card comes complete with a 486DLC chip (either Cyrix or Texas Instruments) plus the miniaturized hardware needed to support it. In this respect it differs from their earlier ChargeCard. The ChargeCard for 286's only, reused the original CPU chip, adding only hardware support that boosted its performance to near 80386 levels. By going the processor-level route, ALL has neatly sidestepped the problem of incompatible bus structures. This is a significant advantage.

Compatibility

There is a lot of odd-ball hardware out there, Packard Bell 286 machines, for example, are not compatible with slot-based upgrade adapters but will accept the ALL DX 486 with the same ease as those from other vendors. Packard Bell, we are told, not only officially acknowledges but recommends the All card.

And then, of course, there's MicroChannel—there are a lot of those out there, and IBM users in particular may find this upgrade to be quite cost effective since replacement motherboards are really not an option for the PS/2s.

Installation

Indeed, the 10-minute upgrade claim is real—or should be in most instances (at least as far as the hardware installation is concerned)—with the greater part of that required to take the cover off of the machine and replace it. In our case we had to temporarily remove two floppy drives to get down to chip level on our board, and that took a little longer. Once we had a clear shot at the old 286 chip it was a breeze.

ALL supplies an excellent chip removal tool with the kit now (the removal tools supplied with their old ChargeCard's left a lot to be desired). The old chip popped right out, we slipped the card in place, and we were done with the hardware part of the upgrade. As with all such add-in devices, the ALL DX 486 card is a nonstandard device and requires an installable device driver (installed from the CONFIG.SYS) to fully interface with the transplant. Of course, right from the moment you switch the power on the system has to recognize the CPU chip as something closely approximating what it was designed to work with. It uses that level of smarts to boot up to where it's ready to accept special drivers.

Installing the driver from the installation disk supplied is simple, quick, and automatic. However since the upgraded system now supports such things as mapping RAM to upper memory—something possible with only limited success up until now on 286's, you'll definitely want to install a better memory manager than whatever you've been using.

The ALL upgrade kit includes the latest version of their own 386/486 memory manager that comes complete with an automatic optimizing program (something you won't see in MS-DOS until 6 is released) which, though not as aggressive as QEMM or 386max in ferreting-out usable address space above 640K is still one of the better performers in the field.

The ALL DX 486 10-minute upgrade option has a lot to say for it, and even at this time of falling prices for replacement motherboards it just might be an idea who's time has come, again, for you.

Price: $499.00
Company: All Computer Company
1220 Yonge Street
Toronto, Ontario
Canada M4T1W1
(416) 960-0111

386 Clock Doubler Chips

Here's a quick cure for the heartbreak of owning an obsolete system!

Need to supercharge your 386DXs performance but don't have a fortune to do it? There's a relatively cheap, easy way to garner nearly a 70 percent increase in processor speed: pop out your system CPU and install Cyrix's new Cx486DRu^{2} chip.

"It's actually a 486 that replaces your 386DX," said Paul Pascarelli, upgrade marketing manager for Cyrix. "The gains are dramatic, too, especially in the area of graphical user interfaces (Windows) and processor-intensive applications."

Though some might quibble over the Cx486DRu^{2}s technical status as a full-fledged 486, its performance doesn't engender dispute. It uses clock-doubler technology to boost

16Mhz 386s to 32, 20s to 40, and 25s to 50. "If you're tired of looking at the Windows hourglass, the DRu²s for you," Pascarelli said.

Just what is the DRu² and how does this silicon wafer double processing performance? The secret is backward compatibility via the 132-pin connector built-in to the 386 CPUs base. The Cyrix chip is made to plug into a 386DX motherboard socket (not SX), yet the microprocessor itself has the 3.2 million transistor heart of a 486. Some compromises were necessary to accomplish this—hence the questions about its true 486 status—but clever engineering has produced numerous workarounds and even some advantages.

- The chip uses the 486 instruction set, meaning it accomplishes tasks in a single clock cycle. This increase in efficiency over the 386 dual cycle execution is a major plus and one of the chief reasons it's described as "clock-doubled."
- The chip carries an onboard (hardware) 1K cache, seven less than full-fledged 486s but more than the "0" in 386s. According to Cyrix 1K is 85 percent as efficient as eight; its reduced size vis a vis competitors was necessitated by the 386/486 pins and socket (its footprint).

"We just didn't have the luxury of (486 motherboard) real estate," Pascarelli said.

- The 486DRu² is similar to the 486SX chip rather than the DX in that no on-board floating point math calculator (coprocessor) exists. But a machine equipped with a 486DRu² may still use a 386 math coprocessor to increase its capabilities, one rated at the machine's original megahertz, not the clock-doubled speed.
- Installing the chip is a snap-in operation and, just as importantly, takes zero precious RAM. Some software configuration is necessary, but the necessary utilities for DOS, Windows, OS/2, UNIX, and Novell Servers are supplied. All the drivers merely configure the system at boot-up and aren't TSRs.

What about compatibility? Though everyone says their products mesh nicely with commercial software and hardware, the reality is often different. In this case, Cyrix's Pascarelli said extensive testing has shown no problems at all. Technical documentation also details a long compatibility test list, all with no problems. Accelerator boards present no obstacle either, he said. The only cautionary note concerns old BIOS (basic input/output systems), some of which may not be compatible with the 486 instruction set. We suggest you call either Cyrix tech support or its distributor, Team Xerox, to be sure your BIOS is compatible.

Could heat be a problem, or the possibility of the clock-doubled chip outstripping the other components on the motherboard and causing system crashes? Pascarelli said no, that extensive testing had shown no heat-initiated conflicts. He cited Cyrix's one-year chip warranty.

"We have complete confidence in our products. You don't have to worry about heat."

As to the chip outstripping other motherboard components, Pascarelli noted it would only be possible if, for example, a computer had "out of spec" components. "If a computer had 100 nanosecond RAM instead of the (70 specified, for example) there could be a problem. But we just haven't encountered anything like this in our testing."

In the real world, what will the clock-doubled chip do for you? Don't expect the full 70 percent speed increase claimed, for instance, as most operations entail a combination of processor, hard disc, video card, and other component operations. The new microprocessor, of course, only affects chip operations. But even if your overall increase is half of what is claimed, for its $399 full retail price it is still a low-cost avenue to higher performance.

Will the Cx486DRu² actually install as easily as claimed? Assuming you have a standard snap-in, not soldered down, chip, the answer is a qualified yes. You'll need at least 3/4-inch motherboard height clearance to install it, and your CPU will probably have to be taken almost completely apart to get the working room around the board you need. Cyrix supplies all necessary pullers and tools in its $399 kit.

Warning: Intel recommends that the motherboards always be taken out of the case and placed on a solid surface protected by a cloth, before removing and adding a new microprocessor. Motherboards will flex up to a certain point before they may be damaged. Replacing a microprocessor chip while it remains inside the system may cause cracks in the layers.

Cyrix's Pascarelli said the Cx486DRu² is designed to breath new life into the nation's 18 million aging 386DX systems.

"The price of computers has come down, but upgrading is still a viable alternative. Three-eighty-six SX system enhancements" aren't too far down the road either, he added.

Price: $399.00
Company: Cyrix Corporation
2703 North Central Expressway
Richardson, TX 75080
FAX (214) 699-9857

Distributed via Team Xerox
703-442-6811

CompuServe—the Electronic Upgrade

If you have a question, any question, on any topic, the answer can be found somewhere within the digital confines of Compuserve's vast information data bases.

By Mike Morrison

Without a doubt, CompuServe is the largest online network for people with personal computers. It contains literally gigabytes of programs and data available for downloading, everything from shareware diagnostic software to the latest Windows NT video drivers. Not only does it contain files for downloading, it also offers direct access to hundreds of computer related companies. Technical support people monitor these areas daily, and sometimes the original programmers themselves join in the discussions!

Even more than a large BBS, CompuServe is a meeting place of professionals. Business transactions take place daily with the fervor of Wall Street: writers dealing with editors, graphic artists negotiating the best price for their works, contract programmers bidding for work on a new application. Even though CompuServe's policy is not to allow advertising or promotions in public areas, a lot goes on in the private electronic mail.

When it comes to communicating with the electronic world, CompuServe offers access to just about everything. Many electronic links are available such as public and private electronic mail, Internet, AT&T Mail, MCI mail, Telex, FAX servers, and even standard postal mail. The latest news is always available with electronic connections to the Associated Press, United Press International, and many other new agencies. You can even enter your personal areas of interest and CompuServe will automatically capture any relevant stories as they become available. For researching data there are over 1,400 online databases.

There are many special interest groups for personal hobbies. If you like science fiction, you can join the SCI-FI area and have an online chat with Douglas Adams, author of the Hitchhikers Guide to the Galaxy series. Do you have an interest in politics? Join the literature forum and have a rousing exchange with the controversial radio talk show host, Rush Limbaugh. For other entertainment, you can join in a multiplayer game or shop in an electronic mall with over 100 retail stores.

Getting Started

The only real requirement in gaining access to CompuServe is a modem and some type of communication software. Fairly straight forward online menus will guide you in your quest for information. Once you get online, there are a number of communications programs customized for using CompuServe. We will cover these and their advantages later on.

This first thing you will notice is that CompuServe is divided into areas called Forums. A Forum is a general area for a given topic. For example the Game Publishers Forum is an area for user feedback and support of computer games. Each Forum has at least two parts, the Message Section and the Library Section. A section is a subset of the topic of the forum. So in the Game Publishers Forum the following sections exist in *both* the message and library areas:

1	General/Help
2	Electronic Arts
3	SSI
5	Spectrum HoloByte
7	LucasArts Games
8	Accolade
9	subLOGIC
11	Sierra On-Line
12	Origin
13	MicroProse
14	Interplay
15	Three-Sixty Pacific
16	Other Publishers

Within any Message Section, you can leave electronic mail either public or private. In a Library Section, files are available for downloading and space is sometimes provided for uploads depending on the Forum's subject. For example in the *Origin Systems* library in the Game Publishers Forum, you can download game demos and bug fixes for *Origin* games. When you create a public electronic message with a new topic it is called a thread. Then as more people respond to the message the thread grows longer and longer. Reading down through a message thread is similar to reading the dialog between a group of people. If you download these threads and access them with a text searching program, they can be very useful sources of information.

To access a Forum you type the word "GO" followed by the name of the Forum. The Game Publishers Forum is called GAMPUB. A complete list of Forums is available by typing "FIND FORUMS" at the CompuServe prompt. If you are not sure of the name of a specific forum you are looking for you can type in a general descriptor such as "GRAPHICS" or "HARDWARE". These descriptors take you to "top pages" which group related Forums under one main heading. Under the Hardware top page you will find a menu of all the computer hardware related forums.

Another option within forums is online conferencing. This is where two or more users can have a interactive discussion online. This can be a useful tool when you see that someone else happens to be in the same forum at the same time and you need to ask them a quick question.

Outside Forums

Other online services such as news information, databases, weather, and travel use unique menu structures that are customized to the service itself. For instance, entering the IBM File Finders service simply presents you with a menu of options on finding a particular file. There are no Libraries or Messages in the IBM File Finder. The File Finder is an efficient way to search through all IBM PC related forums to find a particular file. You can search by topic, file submission date, forum name, file type, file extension, file name, or the submitter's user ID.

We have used the IBM file finder to download WordPerfect printer drivers that were not found on the WordPerfect printer disks that come with the program.

The Price of Power

The downside to all this wonderful information and reference material is the cost. When accessing CompuServe, you are charged by the hour in minute increments with a one minute minimum. For 1200 or 2400 baud it's $12.80 per hour and for 9600 baud its $22.80 per hour.

With these connect charges it may look as if 9600 baud is a great deal. Four times the data throughput at only twice the cost. If you mainly deal with electronic mail, your savings may not be so high. With electronic mail, much time is spent waiting on CompuServe to recall and display the message, then the message itself usually does not contain very much data. The result is that message traffic can take just as long with 9600 baud as it does with 2400 baud, but you will pay twice as much with 9600 baud.

For transmitting files or even large messages, the savings of a high data transfer rate like 9600 baud starts to show through.

With increased pressure from less expensive online services such as Prodigy and America Online, CompuServe now offers a flat rate pricing plan. A fixed price of $7.95 per month allows a user to send about 60 three page messages per month. You also can access a number of basic services such as the online encyclopedia and news information. However, the flat rate does not include access to the software and hardware forums, which is one of the most useful features of CompuServe.

There are methods of optimizing your online connect charges. For instance, even though online charges are the same 24 hours a day, accessing CompuServe during off hours is a good suggestion since response time will be much faster. Another method is automating your online sessions with custom communication software.

Software for Accessing CompuServe

When it comes to navigating CompuServe, you can use the built-in menus, as we have already described.

Another method is to use custom software such as the CompuServe Information Manager (CIM) which provides a menu driven interface. CIM is a program available from CompuServe. Its interface shields you from having to deal with the CompuServe menus directly. It is very similar to the way the DOS Shell shields you from dealing directly with the DOS prompt.

There are a number of advantages to using a CompuServe interface such as CIM. The first is that using CompuServe is much easier. Point and Shoot menus are naturally easier than command line interfaces. Furthermore, your online charges will be reduced since many CompuServe interfaces allow you to download Email in batch mode and read it while you are off-line. You also can compose messages off-line then upload them when you return online.

Each CompuServe interface has its strengths, CIM for example cannot fully automate every process of CompuServe but it is perfect for browsing the system and discovering new areas.

Another popular interface is TAPCIS. TAPCIS is a totally automated CompuServe interface, everything is setup off-line, composing Email, specifying files to be downloaded and message threads to read. As you can imagine, the goal of TAPCIS is speed. It goes online, performs the requested steps and then logs off as quickly as possible.

Other automated programs are available in the IBM Communications Forum (IBMCOM) such as AutoSig and OzCIS. Even advanced scripts are available such as CISOP for Crosstalk Mk.4 or Crosstalk Communicator. CISOP is available in the Crosstalk Forum (XTALK).

So to keep your online charges at a minimum, use one of these automated interfaces, and connect at off hours for the best response time.

CompuServe can be your greatest upgrade, and all for the cost of a modem and online connect time.

CompuServe
P.O. Box 20212
5000 Arlington Centre Blvd.
Columbus, OH. 43220
(800) 848-8990

FCC CERTIFICATION: What It Means To You

Scanning through one of those 10-pound computer magazines you notice a strange notation on many of the ads: "Class B certification!" Curious. What's a Class B? And does it have anything to do with making Microsoft Windows run any faster?

You may not be aware of it, but computers emit prodigious amounts of radio frequency signals — not unlike those from the local AM radio station blasting out 50s oldies. But instead of The Big Bopper, your PC generates squeals, blips, and pops that can actually be received using a normal AM radio. Because your computer acts like a miniature broadcasting station, the Federal Communications Commission (FCC), being the good governmental bureaucracy that it is, has decided to regulate it.

Manufacturers of computers, as well as makers of computer components and peripherals are required by the FCC to test their products for radio frequency (or "RF" for short) emissions. The FCC then certifies that the equipment complies with various federal laws about minimum RF emissions.

The FCC offers two certifications for computers and related equipment: Class A and Class B.

Class A certification is less stringent and is provided for those computers that will see use in business. Radio emissions aren't as low as they might otherwise be, but because the PC is mostly likely socked in an office building, there's less chance that the emissions will interfere with radios and TVs.

Class B certification is the Golden Ticket that all computer makers wish for. It's required if the computer is destined for home (an example is the IBM PS/1). As manufacturing techniques improve, more and more computers are given Class B certification. After all these years, PC makers know the causes of excess RF emissions, and use various means to reduce it.

As a consumer, you are required to ensure that the computer you buy and use is properly certified, depending on its use. If your PC is being used at home, it should have a Class B certification. A PC for office use can have either certification.

The FCC provides a number of booklets on Class A and B certification for computers. For more information, write: Federal Communication Commission, Washington,DC, 20554.

COMPARISON CHART: MODEMS $200 & UNDER

Make/Model	Speed (bps)	Auto Fall Back	* Mounting	Bus Interface	Standards	Hayes AT compat.	Power Supply	Software Included	Error Correction	Speaker; Vol. Ctrl.	Send Fax	Other Features	Price
Boca Research M0024I	2,400/1,200/ 300	Y	I	8/16-bit	Bell 212A/103, CCITT V.22/ V.22bis	Y	—	ProComm	N	Y; Y	N	auto dial & redial, stores up to 100 numbers	$99
M0024E	2,400/1,200/ 300	Y	E	N/A	Bell 212A/103, CCITT V.22/ V.22bis	Y	AC	ProComm	N	Y; Y	N	auto dial & redial, stores up to 100 numbers	125
FM9624 Fax Modem	2,400/1,200/ 300	Y	I	8/16-bit	Bell 212A/103, CCITT V.29/ V.27ter/V.22bis/ V.21	Y	—	Mirror Fax	N	Y; Y	Y	auto speed send, cable incl.	165
M2400I	2,400/1,200/ 300	Y	I	8/16-bit	Bell 212A/103, CCITT V.42bis/ V.42/V.22/V.21	Y	—	ProComm	MNP 5, MNP 4	Y; Y	N	V.42bis & MNP 5 data compression	195
FM96EX Fax Modem	2,400/1,200/ 300	Y	E	N/A	Bell 212A/103, CCITT V.29/ V.27ter/V.22bis/ V.21	Y	AC	Mirror Fax	N	Y; Y	Y	auto speed send, cable incl.	195
Cardinal Technologies MB2450	2,400	Y	I	8-bit	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	Quick Link II	MNP 1–4	—	N	MNP5 data compression, auto dial, auto answer	$89
MB2400EX	2,400	Y	E	8-bit	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	Quick Link II	MNP 1–4	—	N	MNP5 data compression, auto dial, auto answer	109
MB2450	2,400	Y	I	8-bit	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	Quick Link II	MNP 1–5	—	N	MNP5 data compression, selectable COM ports	149
MB2450 MNP	2,400	Y	I	8-bit	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	Quick Link II	MNP 1–5	—	N	V.42bis & MNP5 data comp., lifetime warranty	149
2296V420SR	2,400	Y	I	—	Bell 212A, CCITT V.22/ V.21/V.29/V.27	Y	—	Quick Link II	V.42 bis, V.42, MNP 1–5	Y; Y	Y	lifetime warranty	159

* I = Internal E = External All prices are U.S. suggested list. — = Information not available at press time. N/A = Not applicable

Make/Model	Speed (bps)	Auto Fall Back	* Mounting	Bus Interface	Standards	Hayes AT compat.	Power Supply	Software Included	Error Correction	Speaker; Vol. Ctrl.	Send Fax	Other Features	Price
PM2600	2,400	Y	P	—	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	FLASHlink	V.42bis, MNP 1–4	—	N	MNP5 data compression, auto dial, auto answer	179
2450MNP	2,400	Y	I	8-bit	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	FLASHlink	MNP 1–4	—	N	MNP5 data compression, selectable COM ports	189
Computer Friends													
Mercury AT	1,200	—	E	—	Bell 103/212A	Y	—	Quick Link II	—	Y; Y	—		$99
Capricon World Modem	1,200	—	E	—	Bell 103/212A; CCITT V.21/ V.22	Y	—	QuickLink II	—	Y; N	—		136
LightSpeed 2400 LE	2,400	—	E	—	Bell 103/113/ 212A; CCITT V.22/V.22bis, MNP5	Y	—	QuickLink II	—	Y; Y	—		159
GVC													
SM-24H	2,400/1,200/ 300	Y	I	—	Bell 212A/ 103/113, CCITT V.22bis/ V.22	Y	AC	GVC communications software	N	—	N	5-yr. warranty	$89
FM9648/24H Internal	2,400/1,200/ 300	Y	I	N/A	Bell 212A/103, CCITT V.22bis/ V.22/V.29/ V.27ter	Y	AC	Quick Link II Fax/Data	—	—	Y	5-yr. warranty	103
SM-24	2,400/1,200/ 300	Y	E	—	Bell 212A/ 103/113, CCITT V.22 bis/V.22	Y	—	GVC communications software	N	—	N	5-yr. warranty	115
FM9648/24 External	2,400/1,200/ 300	Y	E	N/A	Bell 212A/103, CCITT V.22bis/ V.22/V.29/ V.27ter	Y	AC	Quick Link II Fax/Data	—	—	Y	5-yr. warranty	125
FM-9624HV	2,400/1,200/ 300	Y	I	—	Bell 212A/ 103/113, CCITT V.22bis/ V.22/V.21/V.29/ V.27	Y	AC	GVC communications & fax software	—	—	Y	V.42bis data compression, 5-yr. warranty	145
SM-24HV	2,400/1,200/ 300	Y	I	—	Bell 212A, 103/113, CCITT V.22bis/ V.22	Y	AC	GVC communications software	V.42	—	N	V.42bis & MNP 5 data compression, 5-yr. warranty	159

Make/Model	Speed (bps)	Auto Fall Back	* Mounting	Bus Interface	Standards	Hayes AT compat.	Power Supply	Software Included	Error Correction	Speaker; Vol. Ctrl.	Send Fax	Other Features	Price
FMM9648/24(A)	2,400/1,200/300	Y	P	N/A	Bell 212A/103, CCITT V.22bis/V.22/V.29/V.27ter	Y	AC	Quick Link II Fax/Data	—	—	Y	5-yr. warranty, pocket modem	159
FM-9624V	2,400/1,200/300	Y	E	—	Bell 212A, 103/113, CCITT V.22bis/V.22/V.21/V.29/V.27	Y	AC	GVC communications & fax software	—	—	Y	V.42bis data compression, 5-yr. warranty	169
SM-24V	2,400/1,200/300	Y	E	—	Bell 212A, 103/113, CCITT V.22 bis/V.22	Y	—	GVC communications software	V.42	—	N	V.42 bis & MNP 5 data compression, 5-yr. warranty	179
FMM9696/24	2,400/1,200/300	Y	P	N/A	Bell 212A/103, CCITT V.22bis/V.22/V.29/V.27ter	Y	AC	Quick Link II Fax/Data	—	—	Y	5-yr. warranty, pocket modem	179
FMM9696/24V	2,400/1,200/300	Y	P	N/A	Bell 212A/103, CCITT V.22bis/V.22/V.29/V.27ter	Y	AC	Quick Link II Fax/Data	V.42	—	Y	V.42 & MNP 2–4 data comp., 5-yr. warranty, pocket modem	199
Practical Peripherals **PM2400F**	2,400/1,200/300	Y	—	—	Bell 103/212A, CCITT V.29/27/ V.22/V.22bis/V.21	Y	—	QuickLink II Fax	—	Y; Y	Y	auto adaptive equalization	$99
PM1200SA Mini Modem	1,200/300	Y	E	—	Bell 103/212A	Y	AC	—	N	Y; Y	N	auto adaptive equilization	119
PM2400	2,400/1,200/300	Y	—	—	Bell 103/212A, CCITT V.22/V.22 bis	Y	—	QuickLink II	N	Y; Y	N	auto adaptive equalization	119
PM2400 Mini	2,400	Y	E	—	Bell 103/212A, CCITT V.22bis/V.22	Y	AC	QuickLink II Fax	N	Y; Y	N	auto adaptive equilization	119
PM2400FX96	2,400/1,200/300	Y	—	—	Bell 103/212A, CCITT V.22/V.22 bis	Y	AC	QuickLink II Fax	—	Y; Y	Y	auto adaptive equalization	139
PM2400SA	2,400	Y	I	—	Bell 103/212A, CCITT V.22bis/V.22	Y	—	QuickLink II	Y	Y; Y	N	auto adaptive equalization	139

Make/Model	Speed (bps)	Auto Fall Back	* Mounting	Bus Interface	Standards	Hayes AT compat.	Power Supply	Software included	Error Correction	Speaker; Vol. Ctrl.	Send Fax	Other Features	Price
PM2400FX96SA	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.22/ V.22bis	Y	AC	QuickLink II Fax	—	Y; Y	Y	auto adaptive equalization	149
PM2400 PPM	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.23/ V.22bis/V.22	Y	—	MTEZ	Y	N; N	N	auto adaptive equalization	159
PM2400F Pocket	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.22bis/V.22	Y	battery	QuickLink II Fax	Y	Y; Y	N	auto adaptive equalization	159
PM2400 V.42	2,400	Y	I	—	Bell 103/212A, CCITT V.42/ V.23/V.22	Y	—	QuickLink II	Y	Y; Y	N	auto adaptive equalization	169
PM2400FX96SA MAC	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.23/ V.22/V.22bis	Y	AC	QuickLink II Fax	—	Y; Y	Y	auto adaptive equalization	179
PM2400SA V.42	2,400	Y	I	—	Bell 103/212A, CCITT V.42/ V.23/V.22	Y	Y	QuickLink II	Y	Y; Y	N	auto adaptive equalization	189
PM2400EFX	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.23/ V.22/V.22bis	Y	N	QuickLink II Fax	Y	Y; Y	Y	auto adaptive equalization	189
PM2400SA MAC	2,400	Y	I	—	Bell 103/212A, CCITT V.22bis/ V.22	Y	Y	SmartCom II	N	Y; Y	N	auto adaptive equalization	189
PM2400EFXSA	2,400/1,200/ 300	Y	—	—	Bell 103/212A, CCITT V.23/ V.22/V.22bis	Y	Y	QuickLink II Fax	Y	Y; Y	Y	auto adaptive equalization	199
U.S. Robotics													
Sportster 2400PC	2,400/1,200/ 300	Y	I	—	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	—	CrossTalk Communicator	—	Y; —	N		$179
Sportster 2400 V.42bis/PC	2,400/1,200/ 300	Y	I	—	Bell 212A/103, CCITT V.22bis/ V.22/V.21/V.42/ V.42bis	Y	—	CrossTalk Communicator	V.42/ V.42bis, MNP 2–5	Y; —	N		199
Sportster 2400	2,400/1,200/ 300	Y	E	—	Bell 212A/103, CCITT V.22bis/ V.22/V.21	Y	AC	none	N	Y; Y	N		199

Make/Model	Speed (bps)	Auto Fall Back	* Mounting	Bus Interface	Standards	Hayes AT compat.	Power Supply	Software Included	Error Correction	Speaker; Vol. Ctrl.	Send Fax	Other Features	Price
Ven-Tel PCM2400FAX	2,400/1,200/300	Y	I	8-bit	Bell 212A/202/103, CCITT V.32/V.22bis/V.22	Y	AC	Quick Link II Fax	MNP 2–4	Y; —	Y	5-yr. warranty	$159
Half Card 24	2,400/1,200/300	—	I	—	Bell 212A, CCITT V.22/22bis	Y	—	CROSSTALK	—	Y; —	N	Comm 1–4 selectable, auto speed detection	175
Pocket Modem with Fax 24/96S	2,400/1,200/300	Y	P	—	Bell 212A/103, CCITT V.22bis/V.22/V.21	Y	AC, battery	Quick Link II Fax	—	Y; —	Y	3 LED status indicators, 5-yr. warranty	189
2400 Plus	2,400/1,200/300	—	E	—	Bell 212A/103, CCITT V.22/V.22bis	Y	AC	CROSSTALK	—	Y; —	N		199
Half Card 24 V.42 Fax	2,400/1,200/300	—	I	8-bit	Bell 212A/103, CCITT V.22bis/V.22/V.21	Y	AC	Quick Link II Fax	V.42 LAP-M, MNP 2–4	Y; —	Y	V.42bis/MNP 5 data compression	199

MODEM MANUFACTURERS

Boca Research, Inc.
6413 Congress Avenue, Boca Raton, FL 33487, (407) 997-6227

Cardinal Technologies, Inc.
1827 Freedom Rd., Lancaster, PA 17601, (800) 233-0187, (717) 293-3000

Computer Friends, Inc.
14250 N.W. Science Park Dr., Portland, OR 97229, (503) 626-2291

GVC Technologies, Inc.
376 Lafayette Rd., Bldg. B, Sparta, NJ 07871, (201) 579-3630, (800) 289-4821

Practical Peripherals, Inc.
375 Conejo Ridge, Thousand Oaks, CA 91361, (805) 497-4774

U.S. Robotics
8100 McCormick Blvd., Skokie, IL 60076, (708) 982-5010

Ven-Tel, Inc.
2121 Zanker Rd., San Jose, CA 95131-2177, (408) 436-7400, (800) 538-5121

Part I — The Components

Upgrading to Multimedia

Here's what you'll need to upgrade your current system to multimedia specifications, how to install the primary components (Part II), plus reviews of the top five CD ROM drives (Part III).

Multimedia is here! Magazines are shouting it, computer dealers are shouting it, and most impressive of all, even PCs themselves are shouting it.

Here, we'll explain the different components that make up a multimedia system, show you what each contributes, give you an idea of the benefits and costs of this new technology, and tell you how to add these capabilities to your existing PC.

New Sensations

In the 15 years or so that personal computers have been available, they have evolved from devices able to display 40 unattractive characters of text on a line into sophisticated graphical workstations. Today's 24-bit color Super VGA adapters and monitors routinely provide resolutions of 1,280 by 740 pixels displayed in up to 32,000 colors.

The wholehearted acceptance of the Microsoft *Windows* graphical user interface (GUI) indicates particularly clearly just how effective and desirable visual computing is to most PC users. Since *Windows* is based on pictures rather than commands, it eliminates almost an entire level of mental processing. Instead of trying to remember loads of arcane instructions, commands, or key combinations, the user sees most of his or her choices right on the screen. You see it, you choose it with the mouse, and it's done. At the level of effort it takes to complete a task, life just became a whole lot simpler. *Windows* may not be a great program—it requires relatively expensive hardware, and it crashes too often—but its appeal is obvious and understandable.

But nature has endowed most of us with five senses: sight, touch, taste, smell, and hearing. And the more senses that are involved in a process, the more a part of that process we become. Today's mainstream computing works through touch (in the way we communicate with the PC and application) and sight. Multimedia, at its most basic level, brings your hearing into play.

While there is no universally accepted definition of multimedia, a consortium of companies involved in producing multimedia hardware and software, led by Microsoft, have created a standard that they expect will be accepted as the minimum hardware and software configuration for running multimedia applications.

Multimedia upgrade kits like this one include a sound board, a CD-ROM drive, Microsoft Windows 3.1, and usually a number of CD-ROM programs that incorporate multimedia elements such as sound, animation and full motion video, all for about $700.

They call this minimum configuration the MPC (Multimedia PC) standard. MPC systems are expected to have good-quality color VGA graphics, a fair amount of horsepower under the hood (a 386 SX processor and 2Mb of RAM), at least a 30Mb hard disk drive, extensive sound capability, and a CD-ROM drive able to sustain a data transfer rate of at least 150K per second. Microsoft *Windows* is an integral part of running multimedia applications on a PC, either version 3.0 with Multimedia Extensions, or version 3.1 (which has similar extensions built in). The multimedia extensions provide *Windows* with the seamless ability to make use of MIDI devices and sound cards.

You can buy a PC all set up and ready to run multimedia applications, but you can also add the required capabilities to almost any PC with the requisite processing power (that is, a 386 SX or more powerful chip). Let's take a look at the capabilities of each component of a multimedia PC to see what's necessary to build your own. As we do, we'll see why multimedia applications are inherently better (for many uses) than conventional PC programs.

Lights, Action, Sound...

We've already said that the more senses that are involved in a process, and the deeper this involvement is, the more engrossed in the application the user becomes. Not surprisingly, most of the first multimedia applications were for creating presentations. The reason for making a presentation, whether it's to a professional group, your managers, or to your employees, is to convey information. There have been tomes written on making effective presentations, but most agree on several basic points:

- The presentation must deliver the information in an understandable form.
- The presentation should be visually interesting.
- Motion, whether on the part of the presenter or within the presentation itself, captures attention. If you remember back to your school days, you know that nothing is more boring than a static display of text being read to you by a droning lecturer.
- Sound, either in the form of applicable sound effects or the appropriate background music, also helps focus attention on what's being displayed.

Developing a visually interesting presentation is easy these days. There are dozens of presentation graphics packages which make creating exciting visuals a snap. Lotus *Freelance Graphics for Windows*, Microsoft *PowerPoint*, and Software Publishing Corporation *Harvard Graphics* are just a few of the better-known offerings.

Creating animated presentations is more difficult, but ultimately more rewarding. Animation grabs your viewer's attention, and can be used to more effectively demonstrate certain points or ideas. Because it is more engrossing than a static display, motion is fast becoming an important part of multimedia. While animation is more difficult to produce from scratch than full-motion video, video images require a huge amount of storage space and, because of the need for constant and frequent updating of the screen, are difficult to display without a very high-performance video card. Full-motion video has been effectively demonstrated, and even occasionally implemented, but it's probably a year or two away from becoming a standard part of multimedia presentations. For now, programs like Grolier's multimedia encyclopedia featrues a video section with a full motion video window. A user can watch everything from a butterfly emerging from a cocoon to FDR giving a fireside chat.

See Spot Run

Video is an important part of any multimedia PC, since so much of a multimedia presentation is presented visually. Fortunately, it is also the one area in which most users are MPC-ready. To run multimedia software, you should have a color VGA monitor with a fairly fine dot pitch (.28mm or smaller is best) and a VGA card capable of standard (640-by-480) VGA resolution or better. This will give you a respectable image, but, as with many things, more is better.

The next step up from standard VGA is Super VGA. A resolution of 1,024 by 768 or even 1,280 by 1,024, especially when coupled with a board capable of 24-bit color, can produce a stunning image. But such fine screens take a long time to redraw. If you'll be using multimedia applications featuring extensive animation, or even full-motion digital video, you'll probably be better off with a *Windows* accelerator card. These cards, available for about $400 and up, are optimized to redraw *Windows* screens quickly. Local bus video, now coming into more common use, is also useful. With local bus video, the video adapter is connected directly to a high-speed processor bus, bypassing the much slower peripheral card bus. This arrangement usually results in significantly enhanced video performance.

Left, Right, MIDI

Whether it's used as voice narration, background music, or for special aural effects, sound is the other important component of the multimedia approach. Just as boldface or italicized text or a striking visual graphic allows you to draw the eye to an important point, effective use of sound also can be used to grab the attention of the participant, set the mood, or underscore a point. To prove this point to yourself, just think about the movie scenes you remember best. Chances are excellent that those with striking musical or sound effects backgrounds, like the menacing strings that scored the movie *Jaws*, are among the ones you remember best.

Vendors have taken two approaches to delivering sound: special sound hardware and use of CD-ROM XA. The one that's by far the most popular, and the one that's become part of the MPC standard, is the hardware sound board.

Such boards, available from vendors like Creative Labs, Media Vision, and Turtle Beach Systems, offer two important capabilities. The first of these is a built-in stereo synthesizer complete with a built-in audio amplifier. Just connect a set of speakers and you've got instant sound, music, and speech capabilities. Prices for these cards vary from just about $100 to over $500. What you get for the additional money are more patches (distinct instrument sounds), the ability to play more of these instruments at the same time, and improved fidelity. Most audio cards are compatible with either the now defunct Ad Lib card or Creative Labs' very popular Sound Blaster, though higher-end cards come with their own *Windows* drivers to let your applications take advantage of advanced features. However, if you buy a board that is not at least Sound Blaster compatible, you'll be missing out on any sound oriented CD programs that require it.

The second capability that almost all sound cards provide is the Musical Instrument Digital Interface, or MIDI. MIDI is a specialized serial interface that allows an electronic musical instrument like a synthesizer to communicate with other MIDI-equipped instruments or PCs. MIDI capability is useful if you have an electronic keyboard and you'd like to use it as an additional audio source. Using MIDI, you can split music so some of the instruments are generated by your sound card while others come out of the synthesizer. If you like to create your own music, MIDI will let you use an electronic MIDI keyboard as an input device to a program called a sequencer. Sequencers, which also work with most sound cards, are like the software equivalent of a multitrack tape recorder. They're not all that easy to use, but if you're a fan of computers and music, they can be a lot of fun.

Most casual users won't make much use of the MIDI capabilities that audio cards offer. But if you need advanced music abilities, it's nice to be able to run a cable between a rack-mount synthesizer or keyboard and your multimedia PC. For most of us, though, a small pair of stereo speakers will do the job just fine.

CD-ROM Is More Than Just Heavy Metal

While it's not strictly necessary for a multimedia system, CD-ROM is still an important aspect. In fact, between 80 and 90 percent of all multimedia applications are distributed on CD-ROM, some just on CD (as with Lotus *1-2-3 for Windows with Multimedia Smarthelp* and Microsoft *Cinemania*), some on several media including a CD (as with Autodesk's *Multimedia Explorer*, which comes with both a CD-ROM and diskettes.)

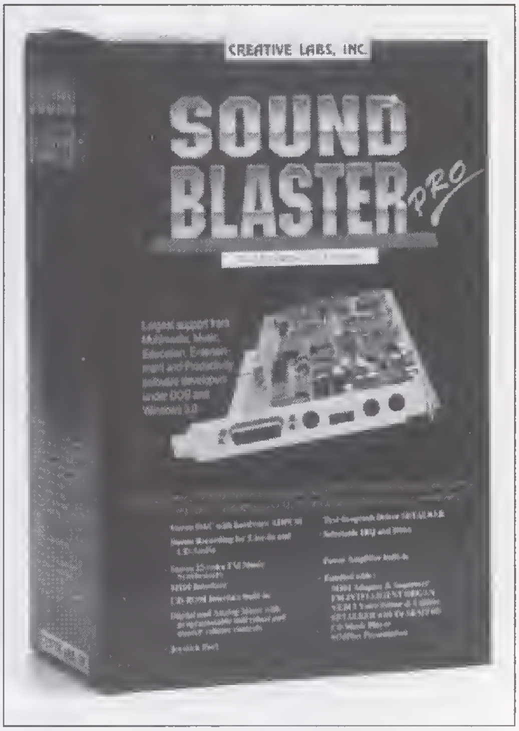
The reason for CD-ROM's popularity in multimedia is simple—a single CD can contain up to 660Mb of data. That's over 500 floppy disks' worth of programs, sound, and graphics. The newest CD-ROM standard, CD-ROM XA (for eXtended Architecture) uses data compression to fit even more on these shiny discs. In fact, Sony's recently introduced Multimedia CD-ROM Player uses the audio compression capabilities of CD-ROM XA to eliminate the sound board altogether. All of the audio information is stored in compressed form on the CD-ROM.

While you don't need one of the new CD-ROM XA drives to run multimedia applications, if you're putting together your own MPC or upgrading an older PC for multimedia, you might want to try and stretch your budget for a drive that meets the XA standard. Having an XA-compatible drive will let you take advantage of enhanced multimedia applications that make use of XA features as they become available. Many XA drives are also compatible with Kodak's new PhotoCD technology, that digitizes photographs and places them on a CD-ROM.

Regardless of whether you buy a standard or XA drive, make sure that your selection is capable of a sustained data transfer rate of 150 kilobytes per second or more. Read the specifications! The MPC standard specifies a maximum seek time of 1 second or less (the time it takes the drive to find the data it's looking for), but you can buy a good quality drive for between $350 and $500 with a 350-millisecond or shorter seek time. Slower times are acceptable, but they frequently introduce a very noticeable lag in using multimedia applications, especially when the application has to frequently access the disk.

How does this all tie together? In the CD-ROM version of Lotus *1-2-3 for Windows*, multimedia technology is effectively used in the on-line Help function. Lotus calls this ability SmartHelp, and it consists of animated segments accompanied by a voice-over which explains what's taking place in the animation. You access SmartHelp by selecting the desired topic in the on-line Help screen and clicking on a "movie" icon. Say, for example, that you want to know how to duplicate a formula into a number of different cells on the spreadsheet. Normally, you'd open up the on-line Help window, click on the topic, and read the description explaining what needs to be done. With SmartHelp, you locate the topic, then click on the "movie" icon. A window opens up on your screen showing an area of a spreadsheet. As the cursor arrow moves to the cell containing a formula, a voice instructs you to "First move to the cell that contains the formula that you need to replicate, and click on it..." Having multimedia SmartHelp is a lot like having a helpful—and infinitely patient—friend sit down at your PC and show you what you want to know.

On the entertainment side, a perfect example of the effective use of multimedia is Microsoft's new *Cinemania*. An interactive movie guide, *Cinemania* contains information on more than 19,000 movies, including cast lists; reviews; biographies of the actors, directors, and other members of the crew; and even stills from most of the movies. If you click on the little speaker icon that appears underneath many of the stills, you'll get a piece of dialogue from the movie. Many of the reference CD-ROMs that have come out this year, like Microsoft's Multimedia Bookshelf, several of the multimedia encyclopedias, and many others also put the sound capabilities to good use. This is when having a Sound Blaster compatible sound board is critical. Without it, you may be watching silent movies.



Sound Blaster and Sound Blaster Pro have become the defacto standard for sound boards. If the board you're contemplating buying does not have Sound Blaster compatibility, don't buy it!

Buy It, Or Build Your Own?

There are three ways you can get a multimedia system these days. First, you can buy a complete multimedia PC. These systems have the sound card, CD-ROM drive, and required software already installed. This is obviously the easiest way to get started, and you usually won't even have to pay a premium. With prices about $500 to $800 more than vendors' plain-vanilla PCs, this is the best way to go if you are already in the market for a new system.

Assuming that you have a perfectly serviceable 386 SX or better PC already, you can add each multimedia component individually, as your budget permits. A sound card will run between $100 and $500, depending on the capabilities you want. *Windows* 3.1 already comes with the applicable drivers for many of the most popular sound cards; just use the Control Panel to install the appropriate one. If you are running *Windows* 3.0, you'll need the Multimedia Extensions for *Windows* 3.0. Sometimes the sound card vendor can provide them; other times you'll need to order them from Microsoft or download them from a BBS. If you're really serious about multimedia, your best course is just to install *Windows* 3.1.

Finally, you can buy a multimedia upgrade kit. Vendors like Creative Labs, Media Vision, Media Research, and Turtle Beach offer these kits, and they include everything you'll need to upgrade your existing PC into an MPC system including a CD-ROM drive (usually this is an internal unit), a sound card (often with a MIDI interface), and the *Windows* 3.0 Multimedia Extensions. Frequently, these kits contain plenty of other software, such as a selection of CD-ROM applications, and even MIDI sequencer software. Prices vary depending on how sophisticated you want to get, but complete upgrade kits are available from numerous mail-order vendors from under $600 to over $1,000. If you're going to upgrade an existing PC, you'll spend less for a kit than you would buying the components piecemeal.

You Know It Don't Come Easy

Right now, multimedia is more something you use than something you create. It is possible to make up your own multimedia presentations, but it sure isn't easy. Animation, even with software packages like Autodesk *Multimedia Explorer*, Asymetrix *ToolBook with Multimedia Resource Kit*, and Presidio Software *PC Animate Plus* let you create a presentation with animated components and even add sound and music. But it's still a tedious process at best, taking hours or even days of effort to produce a few minutes of finished product. It may be practical for an accomplished graphic arts or audiovisual department to create a multimedia presentation with these tools, but the amount of effort and learning time necessary before you can produce something of quality makes it impractical for the average user.

For many of us, the benefits of multimedia come in the enhancement that the technology brings to those applications we use frequently. Multimedia Help is often easier to use than conventional Help, and it's also a lot more useful to actually see something demonstrated than just read a description of how it's done. And while there's lots of good educational software now, for both adults and children, multimedia enhancements to this genre of programs will make it far more effective.

Multimedia technology is still relatively new, and like all new developments, it will probably be used to excess. You can probably expect to see, at least until things settle down, things like famous comedians explaining that you've made an error, programs that announce themselves with marching bands and trumpet fanfares, and other such nonsense. Such stuff appears every time new technology makes this kind of excess possible—just as the first 3-D movies contained nothing but shots of people walking straight into the camera and throwing things over the audience.

But as things calm down over the next year to 18 months, you'll see the multimedia hoopla die down and the technology become accepted as just another expected aspect of a well thought-out software package. And just as it has become simple to create a stunning and effective graphic presentation with packages like *Freelance Graphics for Windows* and *PowerPoint*, it will also become much easier for you to create your own multimedia presentations. By stringing together pre-animated scenes and pre-recorded musical soundtracks, it won't be long before creating a multimedia masterpiece is as easy as pasting clip art into one of today's draw programs. ■

Companies Featured

ATI, 3761 Victoria Park Ave., Scarborough, Ontario, CANADA M1W 3S2, (416) 756-0718

Cardinal Technologies, 1827 Freedom Rd., Lancaster, PA 17601, (717) 293-3000, (800) 233-0187

Covox, 675 Conger St., Eugene, OR 97402, (503) 342-1271

Creative Labs, 1901 McCarthy Blvd., Milpitas, CA 95035, (408) 428-6600, (800) 998-LABS

Media Resources, 640 Puente St., Brea, CA 92621, (714) 256-5025

Media Vision, 3185 Laurelview Ct., Fremont, CA 94538, (510) 770-8600, (800) 348-7116

Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399, (206) 882-8080, (800) 426-9400

Part II — Installation Guide

CD-ROM Drives—How To

Prices continue to fall and installation is only a matter of sliding it into a bay and connecting the cables, so there's no reason not to consider a CD-ROM as your next upgrade purchase.

With each passing month, the siren song of compact disc/read-only memory (CD-ROM) technology grows harder to resist. CD-ROM hardware continually improves and its prices decline, better and more diverse software proliferates, and the demand for multimedia systems multiplies. A single CD-ROM disc provides hundreds of megabytes of information—enough to hold a multimedia version of an entire encyclopedia, complete with digitized sound, video, and animation—and today there are hundreds of imaginative CD-ROM offerings to take advantage of this power.

If you want to use CD-ROM software, you will have to purchase a CD-ROM drive. There are numerous CD-ROM drives on the market with varying features and benefits. The variables of speed, adapter cards, transfer-buffer size, multimedia standards, audio capabilities, miscellaneous accessories, and internal/external installation may sound a bit dizzying at first, but just a little basic information will go a long way toward illuminating your search.

What to Look For

Speed When shopping for a CD-ROM drive, one of your initial concerns should be the drive's speed. The first generation of CD-ROM drives featured access times of nearly a full second, with subsequent models decreasing that time to about 600 milliseconds (ms). Much improved, most current CD-ROM systems can retrieve data in 300-350ms. To put this in perspective, consider that the average IDE-based hard disk has an access time of 22ms. The fastest CD-ROM drive's access time is about 275ms and the slowest around 1,500ms.

Access time should be just one of the factors you consider when appraising the speed of a CD-ROM system. Another significant consideration is the data-transfer rate, which is the time it takes data to transfer from CD to RAM. Current multimedia specifications require a transfer rate of 150K per second. (More about multimedia later.)

Controller cards Also important is the type of adapter card a CD-ROM uses. Does the drive use a proprietary controller card or a SCSI (pronounced "scuzzy") controller card? A proprietary card has a few disadvantages, the most obvious being that it will only work with the drive of a particular vendor. Second, most proprietary cards don't perform as well as SCSI controllers and are not the best for "power" processing. Third, most proprietary drives allow only one drive per card. If these limitations sound vexing, you should lean toward SCSI.

SCSI is an industry standard that allows multiple drives to be accessed via one controller. SCSI controller cards yield higher performance than most proprietary cards and allow for more expansion. We suggest buying a CD-ROM drive that supports SCSI. Although A SCSI-supported drive may be more expensive initially, it will save you much frustration in the long run.

Transfer buffer size Many CD-ROM systems feature a transfer buffer (or disk cache) in the device driver to speed data access. If you will be using your CD-ROM for text-based searches and retrievals without graphics or sound, a large transfer buffer may not be crucial. If you are using a highly graphical or multimedia-based application, however, a transfer buffer of 32K or more becomes virtually mandatory. Since the transfer buffer takes up RAM, you may need to experiment with the buffer size to find the optimum balance between speed and memory.

Multimedia standards If you will be using multimedia CD-ROM applications, make sure your CD-ROM drive supports the MPC (Multimedia PC Council) standard. In the case of a CD-ROM drive, the MPC standard requires a data transfer rate of 150K per second. To achieve this, the transfer buffer must be between 32 and 64K.

Besides the CD-ROM drive, the MPC standard requires a particular system configuration, including a computer with a 386 SX or better processor, 30Mb hard disk, 2Mb RAM, CD-ROM drive, sound board, 16-bit VGA monitor and card, and *Windows* with multimedia extensions. This is the minimum configuration, and you may very well want more. I suggest the following as a solid multimedia system: 25-MHz 386 DX or better CPU, 6-8Mb RAM, 120Mb hard drive, CD-ROM drive, sound board, Super VGA card with 1Mb RAM, Super VGA monitor (800 by 600 or 1,074 by 728 noninterlaced), and *Windows* 3.1 with multimedia extensions.

Audio Most CD-ROM drives come with a program that lets you operate the drive with audio CDs. If your CD-ROM does not come with these programs, you should check with the vendor. Of course, you'll also need a set of headphones or amplified speakers to listen to the CD audio playback.

Accessories and extras Before you purchase your CD-ROM drive, make sure it comes with all the necessary device drivers, support programs, and mechanical accessories, including cables and tools. In most cases, CD-ROM drives come with a disk of programs for accessing the drive. One is a device driver file with a .SYS extension and the other is MSCDEX.EXE, a terminate-and-stay-resident program (TSR) that tells DOS to treat your CD-ROM drive as another disk drive. These programs take up some RAM, but they can be loaded into high memory on 386- and 486-based PCs. MSCDEX.EXE is currently in version 2.2.

The CD caddy is an essential mechanical accessory that most CD-ROM drives come with—make sure yours does. Unlike audio CD players, CD-ROM drives do not have a slide-out disc tray. Instead, you put the CD into the caddy and insert the caddy in the drive.

Many CD-ROM kits come with a package of CD software ranging from games, demonstration programs, magazines, and databases to full sets of encyclopedias, atlases, dictionaries, and other reference materials. Not all drives include starter discs as part of the price, but you may want to shop extra hard for those that do. These packages can save you not only money but additional time shopping for CDs. The discs that are bundled with most CD-ROM drives are subject to change, so check with the vendor for the latest offerings.

Internal or external A final factor to contemplate before buying a CD-ROM drive is whether you want an internal or external drive. If you've already filled all the drive bays in your system, you'll have to buy an external drive.

If you have a few empty bays left, however, you may still want to go with an external drive, since they can easily be moved from system to system. Most external drives include output jacks for connecting the drive to an amplifier so you can listen to audio compact discs.

The main benefit of an internal drive is that it can save precious desk space; if you don't need portability, this may be the most efficient choice. While internal drives don't have output jacks, you can play audio CDs by feeding the output to a set of headphones or through your computer's internally amplified speakers.

These are the basic features you should look for in a CD-ROM drive. Your dealer should be able to answer any additional questions you may have. If not, go to another dealer.

Procedure

Installing Your CD-ROM: Bit by Bit

What follows is a walk-through of the installation process for an internal CD-ROM drive. Keep in mind that this section is not meant to replace the manuals that came with your drive. There are many different drive models, and the details of installation and operation vary among them. Instead, this section will outline the basic steps in order to clarify the process described by your documentation.

Step 1: Get the right tools Any time you install a CD-ROM drive or any other peripheral that requires you to open your PC and poke around in-

HIGH PERFORMANCE, MAXIMUM VALUE — Texel's DM-3024 internal and DM-5024 external CD-ROM drives are available bundled with CD-ROM application discs and accessories for multimedia, business, consumer and education applications.

side, there are a few tools basic to the job. The first of these is a clean, well-lighted work area. A dining room or kitchen table will usually work fine. Just make sure that you have enough room to spread out your tools and parts so that you can see well and avoid losing or dirtying anything.

You will also need a screwdriver. In most cases, a Phillips-head screwdriver will suffice, although you may need a flathead screwdriver as well. In some instances, a nutdriver (it looks like a cross between a screwdriver and a socket wrench) can take the place of a screwdriver. Many PCs use hex bolts to hold parts together.

Step 2: Open the PC case First, unplug the cables, peripheral attachments, and power cords from the back of the PC. You may have to use a screwdriver to remove some of the cables from their connections. Most cables will only fit in one connector, so it shouldn't be hard to figure out where to reconnect everything when you have finished installation. In the case of two compatible ports and cables, you may want to label what goes where.

Next, remove the screws that secure the lid of the case to the PC. Make sure you only detach the screws in the corners and along the edge of the case. Otherwise, you risk removing screws from some of the internal mountings. Slide off the top of the case. On some PCs, you will have to lift the lid or, with a tower case, open the side.

Step 3: Configure the controller card: Proprietary cards The next step is to set the address on the card. With a proprietary card, you will have two settings to make: base I/O address and IRQ channel, but in most cases you will not have to change any of the default settings. The CD-ROM drive we installed had a base I/O address of 340H. In our case, this didn't cause any conflicts, but in other systems there may be conflicts with other adapter boards. To change the address, refer to the I/O address chart in the manual that comes with the drive, then set the jumpers—little plastic covers that fit over pins on the card—to cover the pins corresponding to the correct address.

After you have set the base I/O address, you have to set the IRQ channel that the board will use to communicate with the microprocessor. This is also done with jumpers. Your card may require a particular IRQ depending on the device driver that you're using. You may also have to reset the IRQ's of some other adapter cards if there's a conflict. The manual that comes with your system should cover which IRQ channels are in common use. Make a note of which you used: you will probably need to know this when you install the driver and other software.

SCSI cards One of the major advantages of using SCSI is the ability to connect up to seven devices in a daisychain to one port. The host adapter card is the initial device.

Each SCSI device requires a unique identification, which you set either by means of a switch or jumpers located on the device. Once you give the CD-ROM drive an ID, you have to determine which device will be the last in the chain and connect a terminating plug to that device. To connect the terminating plug correctly, refer to that device's instructions.

Step 4: Install the card Now you have to find an open slot to hold the controller card. If you have the usual 8-bit card, you will be able to use an 8-bit slot to hold the card; if you have a 16-bit card, you need to find a 16-bit slot. Remember that you will have to connect a ribbon cable from the card to the drive, so you may want to choose a slot that allows easy access to the card and a clear path for the drive cable. Once you have chosen the slot, unscrew the top bolt from the slot's cover plate and remove the plate.

Take the ribbon cable that came with the drive and attach one end to the pins on the adapter. The manual will show the exact position and proper alignment of the pins and cable plug: in most cases, you will align the red line on the cable with pin No. 1 on the card.

Fit the card's gold edge connector into the expansion slot connector and press along the top edge of the card until it is firmly installed. Screw the expansion card bracket into the bracket hole on the top of the computer case (you can use the screw that came with the computer's slot cover).

Step 5: Remove the old drives Your computer may be designed in such a way that you will have to remove the existing accessible drives from the drive bays in order to install the CD-ROM drive. If so, remove the screws that are holding the drives in their frame: you will have to remove screws from at least one side of the drives and possibly the top of frame.

Next, slide the drives out of their bays. You may find the drives attached to a metal plate that acts as another side of the bay. Gently disconnect the power cords and connectors from any floppy drives that you remove. Make sure you mark the ribbon cables with the location of their connections to the drives: this will save you time and headaches when you reconnect everything.

Step 6: Install the drive Your internal CD-ROM drive should come with a set of rails that fit between the drive and the frame of the drive bay. If your drive bay is wider than the drive or if your other drives have similar rails, you should attach these rails to the drive. If you do not need the rails, then attach the drive to the frame using the screws provided with the drive kit. You will find a set of two screw holes on each side of the drive. One caveat concerning internal drives: While it has not been proven, some experts suspect that early CD-ROM drives created enough of a magnetic field to play havoc with a hard drive that was mounted below the CD-ROM drive. When you install an internal CD-ROM drive, you should affix it either below an existing hard drive or move the hard drive to an internal bay.

Slide your other drives in and screw them to the drive frame. Don't tighten the screws all the way yet. Attach the power and controller cables back to the other drives and attach a power and controller cable to the CD-ROM drive. Refer to the manual for the correct manner in which to attach the controller cable.

Step 7: Secure all connections Now you can tighten up the screws and ensure that all connections are secure. On the inside of the computer case, there should be two screws holding the bay's access cover in place. Remove the screws and the plate and place them in a secure place (you might remove your drive later).

Step 8: Install device drivers and programs You are now ready to install the software and begin testing the system. You do not have to put the whole system back together just to test it. Simply reconnect the power and the monitor. This way, if you need to make any changes to the boards, you do not have to take everything apart again.

Installing the device drivers and other programs is usually a simple task. If there is an Install program on the floppy disk, run it. The Install program will make modifications to your AUTOEXEC.BAT and CONFIG.SYS files for you. If it asks about the base I/O address and IRQ that you are using for the drive, refer to the settings that you wrote down while configuring the adapter card.

If there is no automatic installation, then you will have to copy the appropriate files over to your hard disk and edit the AUTOEXEC.BAT and CONFIG.SYS files yourself. Refer to the user manual that came with the CD-ROM drive to determine which files and drivers you need.

Once the software and drivers are installed, reboot your system. The device driver and software should be loaded automatically at boot time. You will likely notice a decrease in system RAM as well. If your memory manager allows you to reoptimize your TSRs, then do so to regain as much lost RAM as possible.

Step 9: Test the drive Insert a CD-ROM disk in the caddy, then place the caddy in the drive. At the DOS prompt, type "Dir E: /p," if E is the letter assigned to your CD-ROM drive (the drive letter will depend on how many other drives you have in your system). A directory of the drive will come up on the screen. Check the CD-ROM drive instructions to see how to use the drive.

Once the drive is working, it is time to replace the case and cables and close everything up. Disconnect the monitor and power cables if you have not done so. Slide the case back on to the PC and replace the screws that you removed earlier. Hook all the cables back to their original positions, and you are ready to enjoy your new power tool.•

CD-ROM drives come in internal and external versions. Internal drives leave free space on your desk, but external models can easily be moved from system to system, and most include output jacks that let you listen to audio CD's.

When installing your internal drive, make sure you use a clean, well-lighted work area. Some tools you may find useful are a screwdriver and a nutdriver, which looks like a cross between a screwdriver and a socket wrench.

Part III — Reviews

CD ROM Evaluations — Take Five

As part of our multimedia special report, the editors put five CD-ROM drives through their paces.

We tested five CD-ROM drives—three internal and two external. Two, the DM-5024 from Texel and the CDR-84 from NEC, were double-speed drives. All five are available in either internal or external models. Some of the drives came as complete kits and others were sold alone, with installation hardware and software available for the IBM PC, PS/2, or Apple Macintosh at an additional cost. Our test system was a 386-based 33-MHz PC with 4Mb of RAM.

Objective speed testing—which only confirmed manufacturers' stated data transfer rates—aside, we found that the two double-speed drives were the only ones appropriate for running high-end graphics programs. When you're dealing with huge graphics files, the faster data transfer rate really ends up makes a noticeable difference to the end user. Among drives with the same transfer rate, however, speed differences were negligible.

REVIEWS

NEC Intersect CDR-84 Internal CD-ROM Drive

The CDR-84 from NEC is one of several new high-performance double-speed CD-ROM drives hitting the market. The fast, smooth drive performance is made possible by a very fast average access time of 280ms, data transfer rate of 300K, and a 64K buffer. The NEC CDR-84 was one of the first double-speed CD-ROM drives available. It achieves its double-speed performance with what NEC terms MultiSpin technology, which allows the drive to identify data streams and, when appropriate, spin the CD twice as fast.

The drive uses a SCSI interface and is CD-ROM XA-ready. CD-ROM XA is a relatively new and advanced standard found on few drives currently available on the market. Software included in interface kits (sold separately from the drive) enables the drive to play audio compact discs. The CDR-84 is compatible with IBM XT/AT, PS/2, Macintosh, and IBM-compatible desktop and portable computers. (If your portable doesn't have expansion slots, NEC will sell you a SCSI adapter that plugs into the parallel port.) A headphone mini-jack, volume control, and LED indicator are incorporated into the front panel. The drive uses a typical CD caddy. Although the CDR-84 is equipped with a double door and an automatic dust brush, we would have liked to have seen the drive sealed to better keep out dust.

In operation, the CDR-84 performed perfectly. We put it through its paces, trying it with many multimedia programs, and found it performed well for both data and audio needs.

Installing the drive simply required attaching rails, connecting SCSI and power cables, and installing the software. We did find that the drive door's hinges got in the way: we had trouble reinstalling the case because they stuck out. One feature that helps in installation is an arrow above the SCSI connector indicating the location of pin number one. Other nice touches were the standard AT rails and hardware, CD caddy, user's manual, and a Y-splitting power cable. Although the stock drive does not come with a controller card, it may be used with any SCSI card that has a 50-pin connector using ANSI version 3.131. NEC also sells interface kits that provide all the hardware and software required for installation.

The NEC CDR-84 internal drive has a suggested list price of $649 for the bare drive. The external model, the CDR-74, lists for $725. Interface kits are available for both the internal and external models. The list price for the IBM XT/AT interface kit is $89. The kit for the PS/2 and compatibles is $149, the Macintosh kit is $37, and a kit for IBM-compatible portable computers with a parallel-port SCSI adapter is $112.

Price: Internal drive, $649; external drive, $725; XT/AT interface kit, $89.
Company: NEC Technologies, 1255 Michael Dr., Wood Dale, IL 60191, (800) 632-4636.

Procom PICDL

The Procom PICDL internal CD-ROM drive offers solid performance at a good price: the entire kit, including drive, adapter card, and cables, lists for $325. With a seek or average access time of 375ms, a sustained data transfer rate of 150K/second, and a 32K buffer, the PICDL can help you upgrade any ISA-based PC to MPC standards without spending a lot of money.

You don't use a caddy to load CDs into the Procom drive: instead, there's a handy CD tray, similar to the ones in most home CD players. The drive door opens when the tray is pushed gently inward and then pulled out. The tray was very stiff at first, but it gets easier to operate after a few tries. There's no juggling with a disk caddy in one hand and a jewel box in the other, and we found the drawer to be a big plus. Although trays are more user friendly, however, they do allow more dust into the drive interior, which can deteriorate the quality of playback over time. Moreover, caddies tend to keep disks cleaner, with fewer fingerprints and dust and—by extension—fewer data errors. We, frankly, found that the convenience outweighed the damage potential.

The PICDL doesn't have a lot of fancy features. It is a straightforward, capable drive that is easy to install and use. Like the Sony drive, the PICDL has a headphone jack and volume control on the front panel and an RCA jack available through the adapter card at the back of the computer. The controller is a proprietary 8-bit (non-SCSI) card manufactured by Procom and lacks the ability to daisychain devices.

Installation of the drive is simple. The external drive can be used with any IBM-compatible computer, while the internal drive requires a free 5.25-inch drive bay. The interface host adapter card can be used with either the external or internal drive connectors. The *Installation Guide* offers simple, step-by-step instructions and ample illustrations. Appendices give specifications and I/O address information. All you need to install the drive is a screwdriver. Everything else is provided in the kit (including rails for the drive, which we attached before realizing that we didn't need them).

The most difficult thing about installing this drive had nothing to do with the product itself: we just had trouble finding space for fingers inside the cramped test computer. We installed the adapter card, slid the drive into an open bay (after taking off those unnecessary rails), connected the cables, and ran the installation software, all without incident. The installation software provides one warning: you may need to change the interrupt and address on the host adapter card (instructions are provided in the manual).

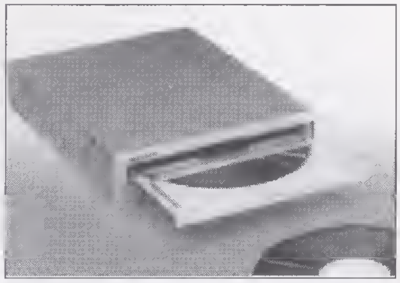
Both the internal and external drives by Procom are available with bundles of CD titles. The PICDL internal drive lists for $325 complete with drive, adapter card, cables and software. An external model, the PXCDL, is available for $395 list. The last drive we tested was the DM- Both carry a two-year warranty—unusually generous. Procom will be releasing several new CD-ROM drives in early 1993. One drive will be multisession Photo CD capable, which means you will be able to continually add photos to the same disc. The company will also be releasing a faster drive with a sustained data transfer rate of 200K/second.

Price: Internal, $325; external, $395.
Company: Procom Technology, 2181 Dupont Dr., Irvine, CA 92715, (800) 800-8600.

Sony CDU-31A

Sony sells this disk drive as part of its Desktop Library multimedia kit. The complete Desktop Library systems include (besides the CDU-31A) a 16-bit sound board by MediaVision, high-fidelity stereo speakers, and six CD-ROM disks, including TEMPRA Access Photo CD software and five multimedia titles. The Desktop Library System is priced at $849.95 (if you want an internal drive) or $1,069.95 (for an external drive). Sony's Multimedia Starter Kit includes the internal CD-ROM drive, *GeoWorks* CD-ROM Manager, TEMPRA software, and two multimedia titles. The suggested retail price is $499.95.

The Sony CDU-31A internal drive is reasonably fast by most standards, with an average random access time of 550ms. Compared with the Procom drive, however, which has an average access time of 375ms, the Sony was noticeably slower. The CDU-31A drive sustains transfer of 150K of data per second at 40 percent or less of the CPU bandwidth. Its transfer buffer holds 64K of data.



Among the drive's features are an audio interface that allows the user to play standard compact discs on the CD-ROM drive while simultaneously working on a program from the hard disk drive. The drive is also CD-ROM XA and Kodak Photo CD compatible. The internal model, which fits in a 5.25-inch drive bay, has a convenient headphone jack and volume control knob on the front panel. The CDU-31A uses a tray-loading mechanism, eliminating the need for a caddy. Unfortunately, as with all drives using disk trays, its design leaves it more open to dust and other environmental contaminants than drives that use caddies.

The interface kit, sold separately for $109.95, comes with a proprietary (non-SCSI) 8-bit adapter card manufactured by Sony, cables, installation software, and a Sony device driver. The card has a stereo minijack and a 50-pin external interface connector for connecting up to four external Sony CD-ROM drives.

Armed with a screwdriver, we found installation of the drive quite simple. The *Installation Guide* is well illustrated, and instructions are clear and concise. Installation calls for mounting the adapter card, connecting the drive, and installing the MSCDEX and device driver with the software provided. The manual includes an appendix with information on adapter card specifications and customizing CD-ROM Extensions.

One very useful feature is the drive's full compatibility with the Kodak Photo CD standard. The Sony drive supports TEMPRA Access Software (which is in fact included in the

Desktop Library kit) to take advantage of this feature. TEMPRA Access Software allows you to view, edit, and save images from a Photo CD disk onto a hard drive or floppy disk in a number of files formats.

Sony will be releasing a double-speed drive soon (the CDU-561) for users seeking top-end performance . But if you're looking for a Sony CD-ROM drive to run standard CD titles or to use the new Kodak Photo CD standard, the CDU-31A is quite capable. However, you may want to wait for the double-speed drive if you're planning to run high-end graphics or data-intensive CDs.

Price: Internal drive, $379.95; interface kit, $109.95.
Company: Sony Computer Peripheral Products Company, 655 River Oaks Pkwy., San Jose, CA 95134, (800) 352-7669.

Texel DM-5024

The 5024 external CD-ROM drive from Texel comes with a 300K/second data transfer rate, 265ms average access speed, 64K buffer, and a retail price of $699. This double-speed drive gives fast performance at a good price. The double-speed technology is made possible by spinning the CD-ROM disk twice as fast as in standard models. Also available in an internal model, the DM-5024 was designed for users running demanding multimedia applications such as animation, graphics, 3-D modeling, and full-motion video. Like the Toshiba TXM3301, the Texel drive is designed to keep out environmental contaminants like dust, though Texel does not claim the drive is contamination-free. A dust-resistant door, sealed chassis, and self-cleaning lens mechanism are included to protect the drive's performance. A manually operated hinged door opens to allow the user to insert a CD in its caddy.

The DM-5024 features CD-ROM XA compatibility, a SCSI-II interface, and rugged manual Eject mechanism. The drive weighs 6.6 pounds and measures a compact 2.2 (H) by 9.7 (W) by 10.4 (D) inches. It seemed, from our examination, extremely sturdy and is clearly made to last. You can daisychain up to seven SCSI peripherals using the drive's SCSI-II compliant interface. In addition to playing CD-ROM software, the drive can play audio compact discs with the addition of software.

The front panel holds the Eject mechanism, industry-standard caddy, stereo minijack, and volume control. The POWER switch and audio output are located on the rear panel. The DM-5024 also has an auto-switching power supply.

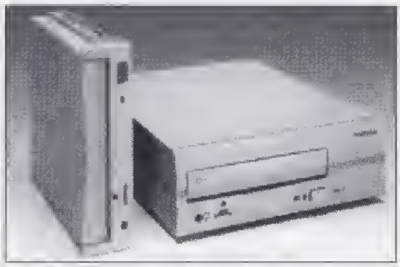
Installation was a snap. We reviewed the IBM PC XT/AT kit, which included everything we needed to install the drive (minus the screwdriver). The *Installation Guide* is informative and well illustrated, with an adequate troubleshooting section. A *User's Guide* is also provided for the SCSI controller; it gives instructions for installation of the 8-bit Trantor T-128 SCSI controller and software. After installing the interface card, we installed the driver software, connected the interface cable, and ran our test CD without a hitch. The drive was very quiet, and at double the speed, we were impressed with its performance.

Several pricing options are available with the Texel drives. You can purchase items singly, or in kits. Optional items, depending on the configuration of your computer system, include an external shielded SCSI cable, a SCSI host adapter card, floppy disks containing device driver software for various host adapters, Microsoft's DOS CD-ROM extensions, or Apple Macintosh device driver software. You can also purchase the drive as a kit. The suggested retail pricing is $599 for the external drive alone. List price for a complete kit (with drive, adapter, cable, caddy, and software) is $699. Kits for the PS/2 are available for $739, and for the Macintosh at $679. Internal models of the drive are available for $100 less; peripheral products are also available separately. Bundled packages with CD-ROM titles for both internal and external models of the drive are available for from $865 to $1,099. In terms of speed, durability, features, cost, and ease of installation, we found the Texel drive to be an excellent value.

Price: Internal drive with PC installation kit, $699.
Company: Texel America, 1605 Wyatt Dr., Santa Clara, CA 95054, (800) 886-3935, (408) 980-1838.

Toshiba TXM3301E

For users who don't have room for an internal CD-ROM drive, or who want a degree of portability, an external drive may be just the thing. The Toshiba CD-ROM drive TXM3301E, is a fast, well-built addition to the family of external CD-ROM drives. Built for speed, endurance, and durability, the Toshiba unit has a 325ms average access time and a 64K buffer, an automatic lens cleaning device, and an emergency Eject button. The TXM3301E is encased in a sturdy and rugged frame that provides worry-free portability. Other features include an embedded SCSI-II interface and a contamination-free and fully sealed enclosure, a reassuring feature when you're working with critical-data CDs.



The internal CD-ROM drive has a suggested retail price of $599. The external drive we tested is priced at $799, and a portable drive for use with laptop or desktop computers is available for $829. The Toshiba Subsystem Kit—containing adapter card, SCSI terminator, driver software, sample disk, hardware, and manuals—must be purchased separately from the drive itself. Subsystem kits are available for the IBM PC XT/AT at a suggested list price of $150, for the PS/2 at $300, and for the Apple Macintosh at $115. The Subsystem Kit manual includes instructions on installing the hardware and software, testing and troubleshooting directions, specifications, and appendices. Detailed illustrations and diagrams are provided.

Setup was a breeze, involving the installation of the 8-bit adapter card and the connecting of the external drive to the plug. The installation software had us up and running in no time, and the operating instructions were straightforward and easy to follow. The Discovery Systems CD-ROM sampler disk that came with the unit was also a pleasant surprise. It held five databases of information, including an introductory brief on the CD drive itself, a desktop catalog of CD titles, a software sampler containing 50 demo programs from Microsoft and more, a Computer Forum with an on-line directory of other computers for comparison, and a CD-ROM Questions and Answers section with a host of technical information about CD-ROMs.

One of the key features of this drive is the fully contained environment within which the CD is read. The front door of the drive completely covers the caddy when installed and closed. This keeps dust from getting at the CD or the drive's works. The drive is also virtually silent when operating, another nice feature, particularly for an external drive. Fitting in a neat 2.7 (H) by 8.7 (W) by 9.8 (D) inches and weighing a little more than four pounds, the Toshiba drive is more compact than the Texel drive we tested—a nice little platform for your coffee cup, though we don't recommend that you use it thus.

The drive is compatible with PC or Macintosh architecture, though you have to buy extra software and cables to attach it to a Macintosh. Requirements for the IBM PC/XT/AT or compatible are a minimum of 512K memory and MS-DOS version 3.1 or greater; PS/2 systems (Models 50-80) require at least 1Mb of memory.

Toshiba will be releasing its new XM-3401 series in the first quarter of 1993. These double-speed drives will have a 330K/sec data transfer rate and a 200ms average random access time, according to Toshiba. The XM-3401 drives are Kodak multisession Photo CD compatible, and will have a suggested retail prices of $695 (internal) and $895 (external). A portable CD-ROM drive will also be available for $925. Subsystem connection kits will be available for the XM-3401 series at prices from $150 to $300.

Price: Internal drive, $599; external drive, $799; XT/AT interface kit, $150.
Company: Toshiba America Information Systems, Disk Products Division, 9740 Irvine Blvd., Irvine, CA 92718, (714) 583-3000.

FYI Tech Tips

It's Good to Have a Screw Loose!

Recently one of our editors installed a CD ROM drive only to have the drive eject the CD carrier every time he inserted it in the drive. The culprit it turned out was his overzealousness in tightening the screws that held the drive in the bay. When he loosened the four screws that held it in place, just enough so that the drive doesn't move when inserting a carrier, but loose enough not to be considered tight, the drive no longer ejected the carrier.

It's a good idea to avoid over tightening during the installation of any drive, floppy, hard disk, tape or CD. While no damage was done, this is not always the case.

Low-cost Font Solutions for Dot Matrix Printers

by Carol Holzberg

Let's be honest! Recipes that substitute margarine for butter, herring for crab, or Gallo for Chateau Lafitte Rothschild won't win any blue ribbons in a gourmet food competition. The same can be said for computers. If your business depends upon the mailings you send or reports you write, printing with anything less than a laser at a resolution of 300 dots per inch (dpi) lessens your chances of looking good in print. You can't make a dazzling impression by skimping on hardware.

In a perfect world, all computers would come with inexpensive, high-quality laser printers capable of producing crisp, razor-sharp output in a variety of typefaces, type styles, and point sizes. Unfortunately, laser printers cost more than many of us can afford. So, unless you've recently won a lottery chances are that you (like me) must print hard copy with an inexpensive dot-matrix printer.

What is Dot Matrix? Dot matrix printers are often called "impact" printers because they produce characters or graphic images by hammering miniature metal rods (pins) against an inked ribbon. Tiny patterns of dots transfer from the ribbon onto paper. The closer the dots, the better the print quality and the higher the resolution.

The print mechanism (or print head) of a dot matrix printer contains one or more vertical rows of pins. Models with 9-pin print heads usually have all 9 pins arranged in a single vertical column. Printers with 24-pin print heads typically set the pins in three columns, with each column holding 8 pins. On both models, the print head often slides in a bidirectional path along a track, firing pins against the ribbon in a matrix-like pattern. With all this hammering and sliding, it's understandable why dot matrix printers tend to be noisy. However, they have been growing quieter with the noise level almost cut to half of its old high pitched whine. That's thanks to a 3 to 6 decible level reduction and the change in pitch to a lower sounding hum. Every three decible levels lower is perceived by the ear to be a 50% noise reduction.

In the early days of dot matrix technology, 9-pin printers could not produce letter-quality output. Users obtained higher quality type by having the printer output extra rows and columns of dots. This gave the appearance of darker output, but it still could not match the quality achieved by conventional electric typewriters. Today, all 9-pin models feature "near letter quality" serif fonts. Their output is quite acceptable for simple text-based documents.

The Pros and Cons of a Dot-Matrix Printer

The demise of dot matrix technology is exaggerated. International Data Corp. (a market research firm based in Framingham, Massachusetts) reports that 1992 sales of dot matrix printers held steady at 5.1 million units, with 24-pin printers representing about 59% of the market. While unit sales for 9-pin printers are declining, sales of 24-pin models are increasing.

Dot matrix printers are popular for several reasons, not the least of which is price. Output from a typical dot-matrix costs as little as a penny a page. The price of a laser-printed sheet may run as high as four or five cents. All dot matrix printers are capable of handling multi-part forms and multiple-paper paths. Wide format models can accommodate paper as large as 14 x 11-inches.

You can expect to pay from $150 to $300 for a 9-pin printer. Most models are limited to a few bitmap fonts (i.e. typefaces that store character set information in only one size). Resolution on 9-pin models varies from 60 x 60 dpi to 180 x 180 dpi compared to 300 x 300 on most lasers. Font size is measured in "pitch" or character width per inch, rather than "points" (character height).

For about $400, you can purchase a 24-pin model. These printers deliver sharper-looking text and graphics than 9-pin models. Output seems less grainy because a 24-pin print head squeezes in more dots per inch. Frequently, 24-pin printers feature resolutions up to 360 dpi. They also usually have scalable fonts, the same face produced in differing sizes and "proportional" type with characters like "i" and "l" taking up less space than either "w" or "m". Yet, high resolution on a 24-pin dot matrix does not match the quality of a 300 dpi laser printer because dots are of a relatively large size.

If there's no money in your budget to purchase a 24-pin printer, or if you're looking for a way to improve print quality of a 9-pin or 24-pin printer you already own, keep on reading. In this article, you'll discover software-based type scaling solutions designed to enhance output of all dot matrix printers. Some products require Windows 3.1. Others run under Windows 3.0. A few even work with DOS applications like WordPerfect, Microsoft Word, or Microsoft Works.

Scalable Fonts

Before scalable font technology, dot matrix printers generated hard copy from fixed-size bitmap fonts resident in the printer. Printers stored only a limited number of these fonts. Each had a specific style, size, and weight (e.g. 10-pitch Courier Bold).

Bitmap fonts used for screen display were not identical to printer fonts because PC screens have a lower resolution than printers. Since screen and printer fonts did not match, WYSIWYG (what you see is what you get) was unattainable. Thus, customizing a document's format became an exercise in trial and error.

Scalable fonts describe characters mathematically as outlines of lines and curves. You can scale them to any size simply by changing their mathematical properties. Unlike bitmap fonts (which are optimized for output on a given printer and require a separate font file for every type size specified in a document), you only need one outline font file to obtain different sizes of a single character set.

Font Generator Software

Outline fonts are device independent. Their output is not tied to any particular screen or printer. However, they may require a font generator to translate character outlines into display or printer fonts.

Special applications, called "rasterizers," create these scalable characters from the outlines. During printing, they send character information to the printer as bitmaps. If a rasterizer uses the same font outline for both screen display and printer output (as it does when running under Windows), you see accurate on-screen representations of printed fonts. Although printed copy still may be somewhat smoother than screen display (because of the printer's higher resolution), font formats that promise WYSIWYG display make document formatting a breeze.

Windows 3.1 has a built-in TrueType font rasterizer that works with fonts in TrueType font file format. Adobe Type Manager (ATM) allows users to work with PostScript fonts under Windows 3.0 and Windows 3.1. There are several other Windows type scalers that generate virtually identical screen and printer bitmaps for any face or size of a supported font format. These include Atech's FastFonts for Windows, Bitstream's FaceLift for Windows, and MicroLogic's MoreFonts. Like TrueType and ATM, these type scalers are frequently "device independent," printing to all types of printers, even dot matrix. Atech, Bitstream, and MicroLogic also offer scalable typefaces for popular DOS applications. These DOS type scalers do not use outline fonts for screen display, so there is no WYSIWYG output.

All dot matrix printers operate in two modes. In "text" mode, they use bitmapped fonts resident inside the printer. In "graphics" mode, they print scalable or unscalable fonts as bitmap graphics. Software controls the order and pattern of dot placement, in effect trying to reproduce the screen's text display. Of course, the quality of printed images still depends upon your printer's resolution. But, with a fresh ribbon and output sent to the printer as graphics instead of text, you get more impressive hard copy than is possible with just the printer's resident fonts.

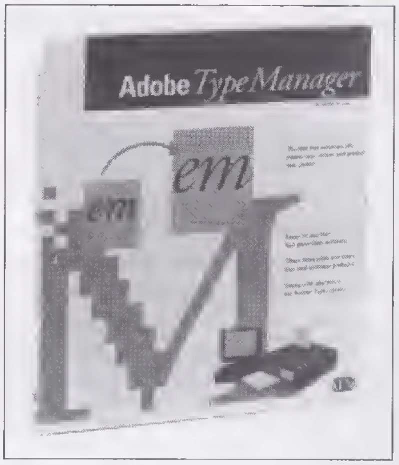
Reviews — *Type Scalers for DOS and Windows*

Adobe Type Manager, v2.5

Adobe Type Manager (ATM) is the type scaler of choice for users who work with PostScript Type 1 fonts or for individuals still running under Windows 3.0. With ATM, you get output approximating PostScript-quality even on dot matrix printers. After you install ATM, its roster of 23 scalable fonts becomes accessible from your Windows application font menu. The latest version lets you add new fonts at any time and use them without having to restart Windows.

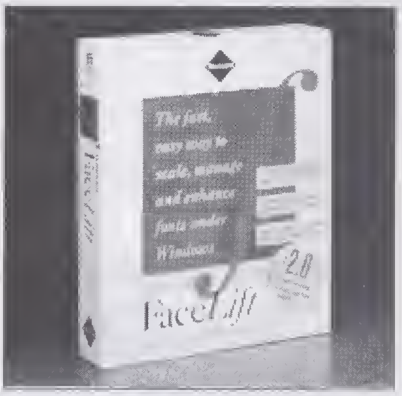
This product emulates a PostScript interpreter as it operates, displaying PostScript fonts on screen and printing them to any Windows compatible printer. Since ATM screen fonts are produced from the same outlines as the printer fonts, the screen displays high-quality typefaces at large sizes without the dreaded "jaggies." There is a close match between the copy you see on screen and printer copy.

Printing, however, sometimes takes a long time, because Type Manager sends information to a dot matrix printer as graphics. Also, in order to use ATM, you must run Windows in Standard or 386 Enhanced mode because ATM does not work in Windows Real mode.



System Requirements: IBM PC or compatible running Microsoft Windows 3.0 or later; 5.25-inch high-density (1.2 Mb) disk drive or 3.5-inch low density (720K) disk drive; hard disk with about 1.2 Mb free space; any printer supported by Microsoft Windows. **Company:** Adobe Systems Inc., 1585 Charleston Rd., P.O. Box 7900 Mountain View, CA 94039-7900 (415)961-4400 **Price:** $99

Bitstream FaceLift for Microsoft Windows, v2.0 and Bitstream FaceLift 1.5 for WordPerfect


The fast, easy way to scale, manage and enhance fonts under Windows
2.0
FaceLift

This type scaler is considered by many to be a versatile alternative to ATM. Originally based exclusively on Bitstream's scalable font format known as Speedo (a popular font scaler used in FaceLift for WordPerfect, and DOS applications such as Lotus 1-2-3, Lotus Freelance for DOS, and Software Publishing's Harvard Graphics), the latest FaceLift now rasterizes both Speedo and PostScript Type 1 typefaces. Like ATM, FaceLift for Windows generates screen and printer fonts from the same typeface outline, so there is an excellent match between what you view on screen and what you print. Information is sent to the printer in graphics mode.

This package comes with 16 typefaces in both Speedo and Type 1 formats. A "Fills 'n' Shadows" option lets you modify these and other typefaces to create custom Speedo or Type 1 fonts with special fill patterns, shadows, and 3D effects. You can organize your fonts into named groups and activate only the groups you need for a particular purpose (e.g. business correspondence, newsletters, or spreadsheets). Options are available to generate custom Speedo typefaces with math, scientific, and other symbols not found in the standard Windows character set.

FaceLift for WordPerfect uses Bitstream's Speedo font-generating technology to produce typefaces on-the-fly for WordPerfect 5.1/5.0, LetterPerfect 1.0, and PlanPerfect 5.1. Fonts can be scaled in sizes ranging from 2 to 500 points. This product supports a variety of inkjet and dot matrix printers and sends characters to these printers in graphics mode. It ships with the same 16 Speedo scalable outline typefaces as FaceLift for Windows (FLW), so if you already have FLW installed you can share Speedo typefaces.

Windows System Requirements: IBM PC or compatible running Microsoft Windows 3.0 or later; 5.25-inch or 3.5-inch high density disk drive; hard disk with 3 Mb free space; any printer supported by Microsoft Windows Publisher. **WordPerfect System Requirements:** 640K IBM PC or compatible with WordPerfect 5.1 or 5.0, LetterPerfect 1.0 or PlanPerfect 5.1 or 5.0; 5.25-inch or 3.5-inch disk drive; hard disk with about 3 Mb free space if printing to a dot matrix printer; DOS 3.1 or later. **Company:** Bitstream, Inc., 215 First Street, Cambridge, MA 02142-1270; (800)522-FONT **Price:** Both versions sell for $99.

FastFonts, v3.02 (DOS); v3.06 (Windows)

This type scaler comes in two versions, one for DOS, the other for Windows, each sold separately. FastFonts incorporates Atech's Publisher's PowerPak, a product that offers scalable output on dot matrix and other non-PostScript printers. Both versions ship with 30 outline fonts that scale from 4 to 1000 points.

The DOS version lets you create personal font sets, picture fonts, and special effects fonts for use with DOS WordPerfect, Microsoft Word, Microsoft Works, WordStar, Letter-Perfect, and PlanPerfect. Special effect enhancements include pattern fills, backgrounds, outlines, and drop or 3D shadows. Artwork may be imported in Adobe Illustrator or Encapsulated PostScript format and mapped to a specific character. The Windows version offers the same font creation options, but works with applications that run under Windows 3.0 or 3.1. Both versions include a Font Metrics Editor to adjust font character widths, kerning values, and leading.

At installation, the DOS version searches a specified hard drive for any applications that can use the FastFonts typefaces, then automatically installs those fonts in the application subdirectory of programs you choose. Before you print, just select the FastFonts driver, then format your document with selected FastFonts typefaces. Be sure the file is stored on your hard disk when printing to a dot matrix. FastFonts for DOS stores print information in a temporary file on disk before generating hard copy.

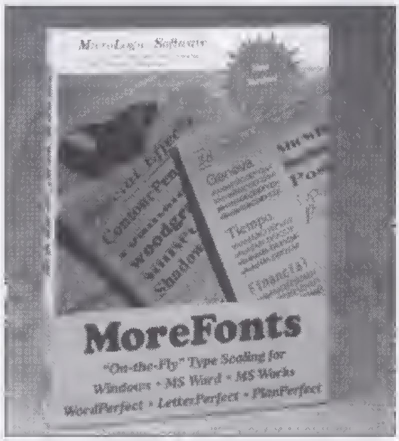
The Windows version generates both screen display and printer fonts from outline typefaces, so you can view output before printing. It features a FastFonts Converter to translate FastFont typefaces to and from PostScript Type 1 and TrueType formats. You can also convert PostScript Type 3 fonts into FastFonts format. A "Variations" command lets you create bold, italic, hollow, thin, wide condensed, and expanded versions of the original font.

System Requirements: DOS version: 640K IBM PC or compatible, 5.25-inch high density or 3.5-inch high density disk drive; hard disk with 6 Mb free space; DOS 3.1 or later. Windows version: IBM PC or compatible running Microsoft Windows 3.0 or later; 5.25-inch or 3.5-inch disk drive; hard disk with 4 Mb free space; any printer supported by Microsoft Windows. **Company:** Atech Software 5964 La Place Court, Suite 100 Carlsbad, CA 92008 (800)786-FONT or (619)438-6883 **Price:** $99.95 each.

MoreFonts 3.0

This versatile utility combines several functions under one application roof. First, it offers on-the-fly typescaling for proprietary MicroLogic fonts, in sizes ranging from 2 to 1000 points. Second, it provides 28 scalable typefaces which can be installed as is, or modified with special type effects, such as pattern fills, outlines, shadows, or backgrounds.

The box includes two versions: one for DOS, the other for Windows. The DOS version provides scalable printer fonts for popular applications like WordPerfect, LetterPerfect, PlanPerfect, Microsoft Word, and Microsoft Works.


MicroLogic Software
MoreFonts
"On-the-Fly" Type Scaling for
Windows • MS Word • MS Works
WordPerfect • LetterPerfect • PlanPerfect

The Windows version provides matching screen and printer fonts for Windows applications like WordPerfect, Word, Ami Professional, PageMaker, and Ventura Publisher. It even works with WordPerfect's printer drivers under Windows and lets you use TrueType, Adobe Type Manager, and FaceLift type-scaling programs with WordPerfect's laser printer drivers.

System Requirements: MoreFonts for Windows requires an IBM PC or compatible running Microsoft Windows 3.0 or later; 3.5-inch disk drive; hard disk with 1.5 Mb free space; any printer supported by Microsoft Windows. MoreFonts for DOS requires a 640K IBM PC or compatible; 3.5-inch disk drive; hard disk with 1.5 Mb free space **Company:** MicroLogic Software 1351 Ocean Ave. Emeryville, CA 94608-1128 (800)888-9078 or (510)652-5464 **Price:** $149.95

Font Utilities AllType, v2.05

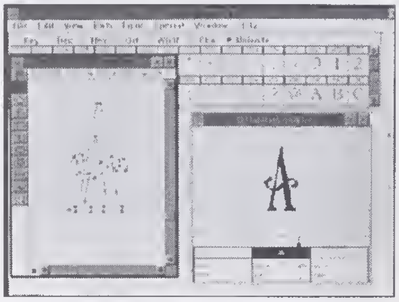
Font Utilities AllType, v2.05 This font conversion utility enables you to translate outline fonts from one format to another. Supported formats include TrueType, PostScript Type 1 and Type 3, Atech's own FastFont, GeoWorks Ensemble, and others.

In addition, the program lets you create a "new" typeface by modifying the slant, leading, and weight of an existing font or by adjusting for style (i.e. bold, italic, bold italic, hollow and others). The package comes with separate versions for DOS and Windows, plus 2 free typefaces (Aurora and Memo). You can direct AllType to install converted fonts into supported applications. However, to take advantage of scalable fonts in MS Word, MS Works, or WordPerfect, you must also install a scalable type manager like FastFonts, Bitstream's FaceLift, or Adobe Type Manager.

System Requirements: DOS version requires 640K IBM PC or compatible, 5.25-inch or 3.5-inch disk drive; hard disk with 1.5 Mb free space; DOS 3.1 or later. Windows version requires IBM PC or compatible running Microsoft Windows 3.0 or later; 5.25-inch or 3.5-inch disk drive; hard disk with 2.5 Mb free space **Company:** Atech Software 5964 LaPlace Court, Suite 100 Carlsbad, CA 92008 (800)786-FONT or (619)438-6883 **Price:** $79.95

Fontographer for Windows, v3.5

Windows-based Fontographer gives professional typographers and novice font developers tools to create outline and bitmap fonts from scratch. This specialized graphics editor also lets you modify existing fonts by altering type style, leading, rotation angle, width, and weight or using the "skew" feature. Users can generate "hinted" TrueType and ATM-compatible PostScript Type 1 fonts (i.e. font with built-in algorithms that enhance a character's appearance when printed at low resolutions), plus Windows bitmap fonts (.FON) and Encapsulated PostScript (.ai) files.



Font designs are produced by controlling placement of character points, nodes, curves and outlines, tracing scanned images, or incorporating PostScript artwork. Alternatively, you can create conventional typefaces or design foreign character sets and logos with characters and graphic images mapped to any key or combination of keys. However, the quality and legibility of font output depend upon printer technology. If you care enough to spend big bucks for Fontographer, you should be using a laser printer.

System Requirements: IBM PC or compatible running Microsoft Windows 3.1 or later; 3.5-inch disk drive; hard disk with 2.5 Mb free space; any printer supported by Microsoft Windows Publisher: **Company:** Altsys Corporation 269 W. Renner Rd. Richardson, TX 75080 (214)680-2060 **Price:** $495

FontMonger/Windows, v1.5

It is mathematically impossible to make exact conversions from one scalable font type to another. Nevertheless, a package like FontMonger comes in handy when you want to convert fonts from PostScript Type 3 to PostScript Type 1 or TrueType, complete with hinting for enhanced output quality. This utility also supports conversions to and from Nimbus Q supplied by ZSoft SoftType, Zenographics SuperPrint, and GeoWorks Ensemble, or from Intellifont into any of the other formats. Selected characters or entire fonts can be converted to Adobe Illustrator or Encapsulated PostScript files.

FontMonger's font editing capabilities are less sophisticated than Fontographer's and the package lacks kerning controls. But you do get a set of draw tools to design new typefaces by editing font outlines or manipulating height, width, degree of slant, and rotation of an original character. You can also create new fonts by integrating logos, artwork, or fractions mapped to specific keys, or combining selected characters and symbols from several existing fonts. The package includes a Macintosh-compatible Apple File Exchange translator to facilitate file translation and transfer between a Macintosh and a PC running Font/Monger Windows.

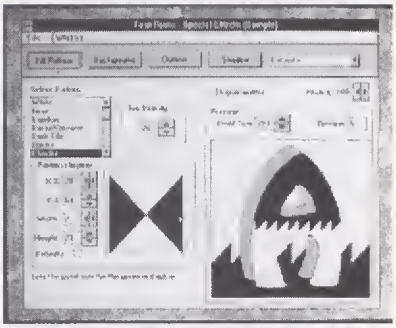
System Requirements: IBM PC or compatible running Microsoft Windows 3.0 or later; 3.5-inch or 5.25-inch disk drive; hard disk with 1 Mb free space; scalable outline fonts in TrueType, PostScript Type 1, PostScript Type 3, Intellifont, or Nimbus Q format; any printer supported by Microsoft Windows. **Company:** Ares Software Corporation P.O. Box 4667 Foster City, CA 94404-4667 (415)578-9090 **Price:** $149.95

Font Packs AllFonts for Business, v1.07

This custom font pack offers 12 type families designed for business documents. Each typeface includes the complete international character set. You can create new font variations from a single original font. Variations include bold, italic, bold italic, or hollow.

To use AllFonts in programs like Express Publisher, MS Word, MS Works, WordPerfect, WordStar, or Windows 3.x, you must use it with a compatible scalable type manager like Atech's FastFonts (see above), Adobe Type Manager, or TrueType. AllFonts Universal Typeface Installer lets you select the scaled typefaces you wish to install and the application where the fonts will be installed.

System Requirements: IBM PC or compatible, 5.25-inch or 3.5-inch disk drive; hard disk with 3.5 Mb free space; DOS 3.1 or later; a scalable font printer, application or type manager. **Company:** Atech Software 5964 La Place Court, Suite 100, Carlsbad, CA 92008 (800)786-FONT or (619)438-6883 **Price:** $79.95

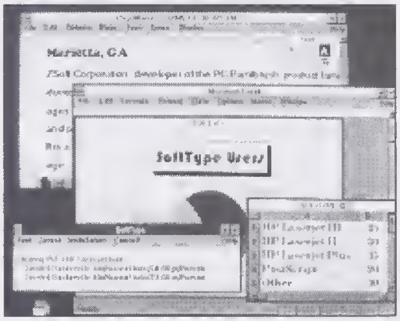


SoftType, v1.6

This Windows utility modifies, styles, and sizes scalable fonts for use in Windows applications, Ventura Publisher (GEM environment), and ZSoft's DOS and Windows PaintBrush applications.

SoftType automatically generates matching Windows screen fonts for printer fonts you create. Point sizes range from 1 to 72 in .05-point increments. SoftType reads Adobe Type 1 PostScript, Nimbus Q, and ZSoft outline fonts. It also generates fonts for use with Adobe Type Manager. Fonts may be output in Adobe Type 1 or 3, Nimbus Q, ZSoft Bitmap and Outline, Windows Screen, and other formats.

The package ships with 62 scalable URW typefaces which you can install as is, or modify with special Font Styles tools that expand, condense, rotate, slant, shadow, adjust a character's gray levels, or apply special 3D effects.



System Requirements: IBM PC or compatible running Microsoft Windows 2.1 or later; 3.5-inch disk drive; hard disk; any printer supported by Microsoft Windows Publisher. **Company:** ZSoft Corporation 450 Franklin Rd., Suite 100 Marietta, GA 30067 (404)428-0008 **Price:** $199

SuperPrint, v2.2

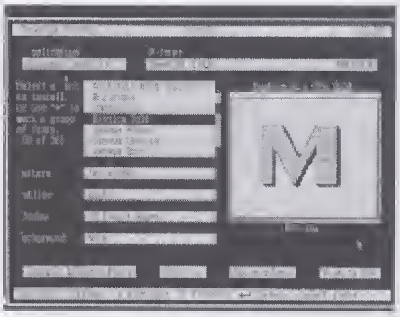
SuperPrint combines three Windows-based print-enhancement applications into one package. "SuperText" generates on-the-fly screen and printer fonts for outline typefaces in PostScript Type 1, Intellifont, Nimbus Q, and FaceLift formats (Bitstream Fontware and Intellifont typefaces must be converted before they are SuperPrint accessible). Since screen and printer fonts are generated from the same scalable typeface, output produced by the printer virtually matches screen display. This utility is compatible with the font generating routines of Adobe Type Manager and TrueType. It ships with 21 scalable typefaces in Nimbus Q format.

"SuperQueue" is a spooler that manages printing in the background. It quickly returns you to your open application, so it may be used instead of Windows' Print Manager. "SuperDriver" uses Zenographics Raster Image Processor instead of Windows printer drivers to send graphics, bitmaps, and outline fonts to the printer.

System Requirements: IBM PC or compatible running Microsoft Windows 3.0 or later; 3.5-inch or 5.25-inch disk drive; hard disk with at least 2 Mb free space after installation; any printer supported by Microsoft Windows; scalable outline fonts such as PostScript Type 1, Bitstream FaceLift, or TrueType. **Company:** Zenographics 4 Executive Circle Irvine, CA 92714 (800)366-7494 or (714)851-6352 **Price:** $149

TrueType for DOS, v1.0

This product provides access to 36 scalable TrueType fonts (the typescaling system built into Windows 3.1) in DOS applications such as WordPerfect, LetterPerfect, PlanPerfect, Microsoft Word, and Microsoft Works. You get TrueType type scaling technology, plus 24 scalable text fonts, 10 scalable display fonts, and 2 scalable symbol fonts. Type may be sized from 2 to 999 points. Printing on a dot matrix printer requires at least 1 Mb of available expanded memory or hard disk space.



Before you can try the typefaces, you must select a specific application and printer. TrueType for DOS then updates the application to make available the specified typefaces and font effects. Font effect options include a choice of patterns, outlines, shadows, and backgrounds. Once installed, the new fonts are accessed from each application's own font-selection menu. Fonts are not installed in alphabetical order, so finding them may take a while. Since MicroLogic uses industry-standard TrueType fonts, you can add TrueType fonts from other vendors as the need arises.

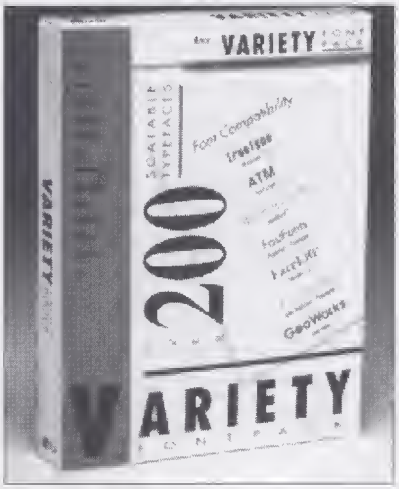
System Requirements: 640K IBM PC or compatible; 3.5-inch disk drive or 5.25-inch drive; hard disk with 3 Mb free space **Company:** MicroLogic Software 1351 Ocean Ave. Emeryville, CA 94608-1128 (800)888-9078 or (510)652-5464 **Price:** $99.95

Microsoft TrueType Font Pack & Microsoft TrueType Font Pack 2

Windows 3.1 ships with five TrueType families: Arial, a proportionally spaced, sans serif typeface; Times New Roman, a proportionally spaced serif typeface; Courier New, a monospace, serif face; and two special symbol fonts. Microsoft TrueType font packs expand your WYSIWYG font options because each package contains an additional 44 scalable TrueType fonts for headlines, text, decorative display, and symbols. All fonts are designed to look good on low resolution dot matrix printers. Font Pack 2 also ships with a Font Assistant application which allows users to view and sort installed TrueType fonts in custom groups.

System Requirements: IBM PC or compatible running Microsoft Windows 3.1; 5.25-inch high-density (1.2 Mb) disk drive or 3.5-inch disk drive; hard disk with 3 Mb free space; any printer supported by Microsoft Windows Publisher: **Company:** Microsoft, 1 Microsoft Way, Redmond, WA 98052-6399; (800)426-9400 **Price:** $69.95 each.

Variety Font Pack for DOS & Windows, v1.0



This collection of 55 scalable typeface families ships with typefaces selected from Atech's FastFonts for Windows and DOS, Publisher's PowerPak, and AllFonts. As with AllFonts, you can create a variety of type faces from a single original font. Variations include italic, condensed, bold, bold italic, and hollow. The package includes a copy of Publisher's PowerPak type manager for scalable output on a variety of dot matrix printers in applications like Express Publisher, MS Word, MS Works, WordPerfect, and WordStar. In addition, it ships with Atech's Universal Typeface Installer, making these fonts compatible with type managers such as Windows 3.1 TrueType, Adobe Type Manager, and HP Type Director.

System Requirements: IBM PC or compatible, 3.5-inch high-density (1.4 Mb) disk drive; hard disk with 3 Mb free space for installation; DOS 3.1 or later; Windows 3.1 users have the TrueType Type Manager; Windows 3.0 users require a scalable font printer, application or type manager **Company:** Atech Software 5964 La Place Court, Suite 100, Carlsbad, CA 92008 (800)786-FONT or (619)438-6883 **Price:** $79.95

Recommended Reading

Following is a short list of references for those interested in learning more about using fonts.

The Computer Font Book, (1993), 384 pp.

This is a practical guide to computer fonts for anyone interested in fonts and font terminology. The author describes differences among bitmap, vector, and scalable font formats. He provides a guide to type style classification and type usage techniques. There are discussions of different printer and display technologies, screen and printed page layout considerations, how to design your own fonts, and font sizing. You'll also find visual samples of several typefaces for a better sense of what's available from different font manufacturers.

Author: Glenn Searfoss
Publisher: Osborne McGraw-Hill
2600 Tenth St.
Berkeley, CA 94710
(800)227-0900
Price: $27.95

TrueType Display Fonts (1992) 56 pp.

This book-disk combination contains 24 inexpensive shareware TrueType fonts for Windows 3.1. Fonts in the collection are intended for use as display text in headlines and special copy, rather than as conventional body text. The book shows printed samples of each font, explains how to install and view the fonts in Windows 3.1, and provides helpful suggestions on where to place particular typefaces in a document.

Author: Bud Aaron & Alex Aaron
Publisher: Sybex Inc.
2021 Challenger Dr.
Alameda, CA 94501
(800)227-2346
Price: $14.95

TrueType Text Fonts (1992), 56 pp.

This book-disk combination contains 24 inexpensive shareware TrueType fonts for Windows 3.1. Fonts in the collection are intended for use as body text, rather than as display type for headlines or special copy. The book shows printed samples of each font, explains how to install and view the fonts in Windows 3.1, and provides helpful tips on drop caps, t-shirt design, and layout of fancy invitations.

Author: Bud Aaron & Alex Aaron
Publisher: Sybex Inc.
2021 Challenger Dr.
Alameda, CA 94501
(800)227-2346
Price: $14.95

The Windows 3.1 Font Book (1992), 174 pp.

The Windows 3.1 Font Book explains how to install and manage TrueType and PostScript scalable fonts under Windows 3.1. The authors describe differences between bitmapped and scalable fonts as well as TrueType and PostScript font formats. You'll also find a "crash course" on the complexities of font terminology, character sets, and Windows fonts utilities.

Author: David Angell & Brent Heslop
Publisher: Peachpit Press
2414 Sixth St.
Berkeley, CA 94710
(800)283-9444 or (510)548-4393
Price: $12.95

All About... Handheld Scanners

To scan, or not to scan? — almost no one bothers to ask that question these days. Every desktop publishing system, it seems, is looking for the best way to add graphics to their spreadsheet printouts, memos, database reports and other desktop publishing applications. Scanners using OCR (Optical Character Recognition) software also take the tedium out of copying text, replacing hours of keystroking with the push of a few buttons.

For many users, the ideal solution is a flatbed scanner, a standalone peripheral measuring 21Dx13Wx3.5 inches high, the size of a large toaster oven. Flatbeds are capable of scanning multiple pages one page at a time. Unfortunately, they start at about $1,500 and go on up into the thousands. In the real world, the best solution may be to use a handheld scanner.

Handheld scanners are T-shaped, measure 1.5 inches high by 5.5 inches long by 5.3 wide at the scanning end. Compactness in a cramped office is an important consideration. They are also a great deal less expensive, typically btween $150 to $450. There is a downside however. They are more difficult to use, eye hand coordination takes some getting used to. You will need to have the time and energy to do a little image stitching to compensate for their smallish windows. Critics talk about "the crooked path" and complain that the biggest problem with hand-held scanners is image distortion. Fortunately, new holding/guiding devices, such as Scan Trac from Pixel Technologies ($29.95) minimizes those problems. And new bundled software allows handhelds to work better than ever. The type of handheld scanner you buy ultimately will depend upon your needs. Black-and-white (1-bit) scanners, also called binary scanners, work best with line art or simple, high-contrast graphics that have limited detail. On the other hand, gray-scale handheld scanners are designed for continuous tone images such as photographs and detailed drawings. The more sophisticated models, which can detect from 64 to 256 gray-scale levels, can produce publishable halftones (depending on your printer's resolution). More about this later.

DPIs (Dots Per Inch) is another important issue in handheld scanners. A 300 dpi Postscript printer, for example, can reproduce a scanned photograph that will appear slightly more coarse than a photograph in a newspaper. Identity Systems and Logitech, on the other hand, will scan at 400 dpi. Mustek's GrayArtist will let you scan at 800 dpi. Of course if you can only print out at 300 dpi one might well ask what is the point of scanning in at 400 dpi or even higher. Two reasons: the sharpness of an image scanned in at one size and printed out in a larger size will be better using a scanner with a higher resolution on the input side. In addition, you can take advantage of the higher capabilities of a service bureau where 1200 and 2400 dpi is customary.

You can also buy color handheld scanners, which will approximate the palette of the image you're scanning. For presentations the image will appear in color on the screen. If all you have is a black and white printer, the color will be interpreted as various shades of gray. Don't expect perfection. Mustek's ColorArtist represents a breakthrough for handheld scanners. It will scan up to 262,144 colors.

System Requirements

You may have to make adjustments to your system to make it compatible with a handheld scanner. Many scanners require at least a '286 processor. To edit gray-scale images you'll need VGA-level video. You may also have to add RAM. Some scanners need as little as 640k of system RAM, while others require as much as 4Mb. In most cases, you will have to add both software and a scanner card which means it takes up yet another slot inside your PC. Mustek's new Printscan 105, however, allows you to use a parallel port adaptor.

If you plan on printing at 300 dots per inch (dpi) or higher, be sure that the scanner software running under DOS supports the Expanded Memory Specification (EMS). Otherwise, images you plan to print at 300 dpi or higher may require several passes. If you don't expand the memory, you'll end up with editing headaches and sloppy results.

When you add a scanner you also may have to change the scanner's interrupt (IRQ) and I/O addresses. This can be done either through software or by resetting dip switches or jumpers on the scanner card. Scanner adapter cards frequently cause IRQ, I/O, and direct memory access (DMA) conflicts with other boards which can disable the scanner, another board, or your entire system. (See Reference Section, p.00.)

Shopping Tips

The best handheld scanners will feature a wide reading window, at least 4-to-5-inches. With a larger window you'll require fewer passes over an image. Also look for adequate controls. Good scanners will have a contrast control button and resolution control that lets you vary your scanning resolution from 100 dpi to 400 dpi or higher. Gray-scale scanners should let you switch gray-scale levels. The better scanners will also have soft rubber rollers. Hard rubber or plastic rollers tend to slip when used on glossy photographs. Always look for a scan switch that toggles on/off. Otherwise you will have to hold down the scan button by hand for the duration of scanning pass.

You also need to be careful about the software you select to run a scanner. Good scanning software should include a stitching function enabling you to merge multiple scans to create a single image. (See figure 1.) Often it should include a realigning function to let you 'straighten out" an image that you may have inadvertently scanned at an angle.

A good software package will also accommodate more than one format. Most gray-scale scanners save images in the TIFF (Tagged Image File Format) format. TIFF was designed specifically for scanned images and is the most popular. It provides for storing and exchanging digital image data and was developed specifically by Aldus Corp. and Microsoft to help link scanned images with the popular desktop publishing applications. It is now used for many different types of software applications ranging from fax modem data transfers to CAD programs and 3D graphics packages. Current TIFF specification supports three main types of image data: black and white data, halftones or dithered data, and gray-scale data.

Many black-and white scanners use the PCX format. PCX is the native bitmapped format for the IBM. Bitmapped graphics are also known as raster graphics.

Whichever native format the software uses, the program should include a file conversion utility. The more file formats your scanner software uses the more programs the scanned image is likely to be imported into.

Some features increase a scanner's range of abilities. For example, brightness control helps rescue washed-out photos and faint or dark originals. Threshold adjustment determines the level of gray a pixel will be registered as and is necessary for picking up faint lines and other design subtleties. Other systems have cropping and image rotating abilities. You can also get horizontal and vertical scanning capabilities enabling you to reach images that extend into the gutters of a stiff book or magazine bindings.

You should also look for hardware/software scanner combinations that can reduce or enlarge an image during the scan. Scaling with a desktop publishing program isn't always easy, especially with dithered images that don't scale well. Dithered images have small file sizes but are difficult to edit and cannot take advantage of high resolution devices. They can, however, be printed quickly. On the other hand a gray-scale scan can be scanned at lower resolutions and is easier to edit and scale. You can also adjust contrast and brightness after scanning a gray-scale, something you can't do with a dithered halftone. Gray-scale files require more disk space and white areas are opaque when placed in a draw program.

Editing is easier to do while scanning in the image. Similarly, pixel editing is another important feature because it lets you make minute changes to the scanned image. You can add a paint-brush program with this capacity, but it is better to have it built-in.

A final word of warning. You should test several handheld scanners out before settling on the one that works best for you. Bring drawings, such as cartoons or sketches, black-and-white and possibly color photographs with you to scan and then print for comparison.

Reviews

Logitech ScanMan Model 256

Logitech's ScanMan 256 retails for $449. It is a well designed, popular easy to use handheld scanner that is able to capture 256 levels of gray. The product requires a 286-based IBM compatible microcomputer at least 1MB of RAM and Windows 3.x software. Although the product does function with 1MB of RAM, 4MB are recommended for better performance.

ScanMan is well designed. The scan button fits your thumb better than most. It is larger and rounded at the top. All scanners, the ScanMan included, emit a high tech hum that is not unpleasant.

We found the ScanMan simple to manipulate with a contrast thumb wheel while scanning. ScanMan Model 256's scan-speed indicator helps prevent blurred images. This light glows green when the user scans at the correct speed but glows amber when the user goes too fast.

The scanner has adjustable settings. You can scan at 100, 200, 300 and 400 dpi. You can scan in black-and-white, or 16, 64 and 246 gray scales.

The hardware comes with numerous software packages such as Windows 3.x-based image scanning software, ANSEL and DOS-based scanning software. Documentation is clear and explains all functions and features. Support is available via bulletin boards and telephone calls. Ansel software supports TIFF, BMP, PCX and EPS (Encapsulated PostScript, output only) formats. It also allows image stitching, flipping, rotating,scaling and skewing. You can lighten, darken, create negative images, equalize, create threshold effects, smooth and sharpen, and allow particular areas to be selected for zooming, moving painting or drawing. You can also order a Scanman 256 with Perceived OCR software for $549.

Company: Logitech
Price: $349
6500 Kasier Drive
Fremont, CA 94555
1347 Exchange Dr.
Richardson, TX 75081
214-235-3330

GrayArtist

Despite a relatively low price ($239 for DOS, $259 for Windows) for a gray scale scanner, the GrayArtist has more than its share of outstanding features, including the ability to scan in at 800 dpi. It is easy to install and use. The technical support was excellent, answering all of our questions quickly and easily.

The scanner saves files in TIFF, PCX and TGA formats. You can fine tune with the contrast/brightness controls. Merging files is easy thanks to quick 2D-sliders. The scanner also has a full array of graphics and editing tools with its Perceive OCR software and Picture Publisher 3.0 LE including geometric shapes and freehand drawing, rotation of whole or part of an image and text overlap with font and color choices.

The 800 dpi resolution enables it to scan very small images. Scanning modes include Super Color Gray, Color Gray, MonoGray, Dithered Color and Text. You may think that the problem you are facing is how can you remember al of these setting but the real problem is that the labels are misleading. The difference is Color Gray offers 4-bit color, Super Color offers 6-bit color. Mono Gray is the only true gray scale setting, six bits per pixel, 64 gray levels.

We found the ridge at the far end of the Mustek color scanner and parallel to the head inconvenient and slightly annoying. Perhaps the designers were inspired by the tail fins of 1960's automobiles. The use of a Scan Trac to guide you as you scan would eliminate this minor inconvenience.

The GrayArtist requires a hard disk drive. It is, however, stingy when it comes to memory, requiring only 640k. Unfortunately, it does not work with XTs but will work on 286's and can work on EGA monitors.

Company: Mustek, Inc.
Price: $239 (DOS)/ $239 (Windows)
17795-F Skypark Circle
Irvine, CA 92714
800-366-4620; 714-833-7740
FAX: 714-833-7813
Tech support: Use main no.

Matador 105

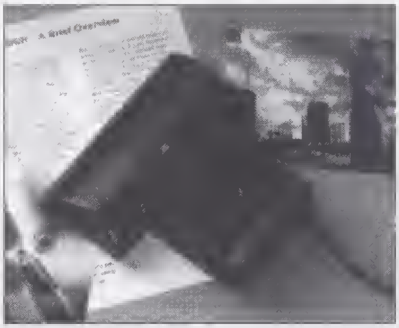
This little 64 gray-scale workhorse can capture images at up to 400 dpi. It also comes with Perceive OCR software, a significant feature. You can save files in TIFF, PCX, CUT, MSP and PIX formats. This device uses the PC Paintbrush IV Plus scanning software to scan and edit images. At $149 suggested retail, you can't go wrong.

Company: Mustek, Inc.
Price: $149

Color Artist

Mustek's Color Artist handheld scanner is a 400-dpi gray scale scanner as well as a 200 dpi color scanner. The device, which costs $499 for the Windows version comes with Perceive OCR software and Picture Publisher, which provides sophisticated image editing tools, including painting, drawing, text tools, linear or logarithmic calculations of gray level, direct manipulation of contrast and brightness.

You can flip, rotate, invert and perform filtering actions on an image. A sophisticated set of painting, drawing, and text tools are also included.



Files can be saved in a several formats, including TIFF, PCX, BMP, TARGA, GIG and EPSF (export only). When you save the file, you can select a number of colors. With some formats you can also select varying compression and resolution levels.

There are also several important printing options. The package allows you to scale the image and to set the printer half-toning method. When you open a canvas, you may also select the base

resolution for the document, targeting either the default printer or the current screen.

Overall, the scanner is easy to use and rolls smoothly. it requires a 386 PC or compatible, VGA or Super VGA monitor, 2Mb RAM, and Windows 3.x.

You can also get a Mac version of this scanner known as the Langelo and selling for $599. It requires a Macintosh SE/30 or ll series.

Company: Mustek, Inc.
Price: $149

Identity Handheld Scan GS

If as the old saying goes you can judge a book from its cover than the Handheld Scan GS is a good machine. The box opens at the middle and resembles a book. However, when you open the volume called Handheld Scan GS what you find is a clever little scanner and lots of documentation.

This 256 gray-scale scanner can work with Xts and EGA monitors. That alone can be considered a big plus. Most other scanners will not work with these systems. The resolution is good, but not as good as the GrayArtist. Scanning resolution can be selected at 200, 300 and 400 dpi.

The software package is impressive. It includes both edit imaging software and OCR software.

Company: Identity Systems Technology, Inc. (subsidiary of Integrated Resource Group)

Price: $99
1347 Exchange Dr.
Richardson, TX 75081
214-235-3330

Nisca Spectra

Is it a flatbed or a handheld? The Nisca Spectra offers a marriage of both worlds. This single-pass, true 24-bit (16 million) color scanner is priced in-between, selling for $899. It looks like a small flatbed scanner but is placed on top of an image like a handheld scanner. Unlike a hand scanner, the user does not have to move it during the scanning process, eliminating any skewing distortion. It comes complete with Micrografx Picture Publisher LE software, which has the stitching capacity found in many handheld scanner packages.

Niscan's Spectra scans at up to 400 dpi and can scale images from 50% to 200%. It features five types of hardware correction settings and seven brightness settings. You can use the Spectra to scan transparencies. The scanner will work from a serial port, which makes the hardware installation as simple as plugging it in.

Company: Nisca Inc.
Price: $899
1919 Old Denton Rd., Ste. 104
Carrollton, TX 75006
800-245-7226; 214-242-9696
FAX: 214-245-0942
Tech support: Use toll-free no.

COMPARISON CHART: HAND SCANNERS

Make/Model	* Feeder Type	Scan Size: Letter/ Legal/ Larger	Font Recognition	Levels of Gray; Number of Colors	Resolution (dpi)	IBM Compat./ Macintosh Compat.	Software Included	Other Features	Dimensions (H X W X D) (in.); Weight (lb.)	Price
Complete PC **The Complete Half-Page Scanner GS**	H	Y/Y/N	opt.	256; none	100/200/ 300/400	Y/opt.	Picture Publisher		1.5 X 3.25 X 5.75; 5	349
The Complete Half-Page Scanner (Macintosh)	H	Y/Y/N	opt.	256; none	100/200/ 300/400	Y/Y	SmartScan II	incl. MacScanner interface	1.5 X 3.25 X 5.75; 5	399
DEST **Personal Scan**	H	Y/Y/N	feature extraction	64; none	300	Y/N	Recognize! OCR software	incl. 16-bit PC/AT interface card	—	$799
Personal Scan for the Macintosh	H	Y/Y/N	feature extraction	64; none	300	N/Y	Recognize! OCR software	incl. std. macintosh serial interface	—	799
DFI **HS 3000-Plus**	H	Y/—/—	opt.	32; 2	100–400	Y/N	DFI Scan Utility, Exerciser, PC Paintbrush Plus, opt. OCR software	incl 8-bit ISA interface card	1.4 X 5.3 X 5.9; 5 oz.	$199
CHS-4000	H	Y/—/—	opt.	—; 256	100–400	Y/N	ZSoft PC Paintbrush IV Plus, utilities, opt. OCR software	incl. 16-bit ISA interface card	1.6 X 5.75 X 4.4; —	599
Logitech **ScanMan Model 256**	H	Y/Y/Y	font trainable	256; none	100–400	Y/N	CatchWord OCR software		1.4 X 5.3 X 5.4; .7 lb	$549
Marstek **Matador 105 for DOS**	H	Y/N/N	—	64; none	100–400	Y/N	Perceive OCR, Scankit Gray utility		—	$149
ImageArtist for DOS	H	Y/N/N	—	64; none	100–800	Y/N	Perceive OCR, PC Paintbrush Plus, Scankit Gray util		—	179
GrayArtist for Windows	H	Y/N/N	—	256; none	100–800	Y/N	Perceive OCR, Picture Publisher LE	for Windows 3.0 environment	—	259
PrinScan 105 for DOS	H	Y/N/N	—	64; none	100–400	Y/N	Perceive OCR, ScanKit Gray	PrinScan parallel port adapter, image scanner	—	299
Langelo Gray for Macintosh	H	Y/N/N	—	256; none	100–800	N/Y	Color It!, ScanReader OCR, Photoshop Plug-In	image scanner	—	359

* H = Hand Scanner All prices are U.S. suggested list. — = Information not available at press time. N/A = Not applicable

Make/Model	* Feeder Type	Scan Size: Letter/ Legal/ Larger	Font Recogni-tion	Levels of Gray; Number of Colors	Resolution (dpi)	IBM Compat./ Macintosh Compat.	Software Included	Other Features	Dimensions (H X W X D) (in.); Weight (lb.)	Price
ColorArtist for Windows	H	Y/N/N	—	—; 262,144	100–400	Y/N	Perceive OCR, Picture Publisher LE	for Windows 3.0 environment	—	499
ColorArtist PRO for Windows	H	Y/N/N	—	—; 16.8 million	up to 600	Y/N	Perceive OCR, Picture Publisher LE, Mustek Slide Show	for Windows 3.0 environment	—	599
Langelo Color for Macintosh	H	Y/N/N	—	64; 262,144	100–400	N/Y	Color It!, ScanReader OCR, Photoshop Plug-In	image scanner	—	599
Sharp JX-320	H	Y/N/N	—	256; 6.7 million	300 X 600	Y/Y	Adobe Photoshop, Tempra-Pro for Windows or DOS, Image-In for Windows	opt. film scan unit	3.75 X 12.2 X 17.5; 15	$1,749
ThunderWare LightningScan Compact	H	Y/Y/Y	Y	37; none	100/200/ 300/400	N/Y	ThunderWorks, READ-IT! OCR Personal	Paint, TIFF, EPS file formats	1.3 X 3.6 X 5.3; —	—
LightningScan 400	H	Y/Y/Y	Y	37; none	100/200/ 300/400	N/Y	ThunderWorks, READ-IT! OCR Personal	Paint, TIFF, EPS, picture file formats	1.3 X 3.6 X 5.3; —	495
LightningScan Pro 256	H	Y/Y/Y	Y	256; none	100/200/ 300/400	N/Y	ThunderWorks, Enhance, READ-IT! OCR Personal	Paint, TIFF, EPS file formats	1.3 X 3.6 X 5.3; —	649

SCANNER MANUFACTURERS

Complete PC, The
1983 Concourse Dr., San Jose, CA 95131, (408) 434-0145

DEST
1015 East Brokaw Rd., San Jose, CA 95131, (408) 436-2700

DFI
135 Main Ave., Sacramento, CA 95838, (916) 568-1234

Marstek: see Mustek

Microtek
680 Knox Street, Torrance, CA 90502, (213) 321-2121, (800) 654-4160

Mustek, Inc.
15225 Alton Pkwy., Irvine, CA 92718, (714) 833-7740

Sharp Electronics Corp.
Sharp Plaza, Mahwah, NJ 07430-2135, (201) 529-8200

Thunderware, Inc.
21 Orinda Way, Orinda, CA 94563, (510) 254-6581

SPECIAL HEWLETT-PACKARD LASER PRINTER REPORT

A How-to Manual

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Upkeep

If you've made the investment in a laser printer, here's a complete guide on how to protect it.

Car experts agree the best way to keep an automobile working properly and efficiently is to perform regular preventative maintenance. That means changing the oil every 6,000 miles or so, tuning up the engine so that it burns fuel more efficiently, and checking under the hood for problems that may occur sometime "down the road."

Funny how LaserJet users almost totally neglect their printers. The LaserJet is perhaps the most complex piece of machinery on your computer desk, and requires regular maintenance to keep it happy and operating at its peak. Most printer maintenance means little more than regular cleaning. A clean printer is a happy printer; besides, your LaserJet lasts longer and works better when it's clean.

There are several cleaning and maintenance steps you can do to keep your LaserJet printer in good working order. They're simple, don't require special tools or know-how, and the cleaning supplies are commonly available.

Frequency Of Checkup

The preventative maintenance (PM) interval for your LaserJet varies depending on many factors. Under normal use, you'll want to give the machine a quick preventative maintenance check every two weeks. By normal use, we mean a printer operated in an average office environment, not on a factory floor or at a machinist's convention.

You may need to perform the checkup on a more timely basis if your LaserJet is subjected to environmental extremes, or is exposed to heavy doses of dust, dirt, water spray (especially salt water), airborne oil, and sand.

How do you know if your laser printer needs a preventative maintenance checkup? Good question. Experience is your only guide, but if you have not yet gained the experience in how often the machine needs routine maintenance, you can't judge if the service interval is required. As you become acquainted with your machine, you will get to know when it needs a checkup. In the meantime, here are some clues that can point you in the right direction:

- The outside of the printer is covered with caked-on dirt, dust, or other grime. If the outside is dirty, so is the inside.
- The pages it prints just aren't what they used to be. Something is amiss inside the printer, but not seriously enough to entirely impair operation.
- The machine makes unusual sounds during printing, or even during idle times.

Another rule of thumb is that if you can see a dusty or dirty build-up, then it's probably past the point where preventative maintenance should have been done.

If you only use your laser printer for a couple of printouts each day, you can probably get by with general cleaning every couple of months. Avoid putting off preventative maintenance any longer than two months, even if the printer is seldom used, because dust can settle and interfere with the proper functioning of the mechanism.

On laser printers that see heavy use — 100 pages or more each day — perform the routine cleaning and preventative maintenance every week.

Clean the printer more often if:

- You are plagued with frequent paper jams.
- The prints come out smudged because of loose toner caught inside the printing or fuser mechanisms.
- The prints are too light, uneven, partially blank, or even completely blank.
- You have nothing else better to do.

A Word Of Caution

It's important to remember that unless you are an authorized repair technician for the LaserJet, doing anything more than opening the printer and brushing out the excess toner and paper bits could void the warranty. You should avoid doing any more cleaning or repair unless you have the specialized knowledge or tools to do so.

Personal Safety

Be aware that potentially dangerous voltages exist in your printer. The LaserJet is an AC operated appliance, and while opening the cover to replace toner cartridge or clear the paper path will not expose you to high voltages, you should use caution nevertheless.

Remember to open the printer ONLY after it has been turned off. If the LaserJet has been printing for any length of time, allow it to cool off before touching any components inside. This is especially true of the fuser compartment. It can become very hot and seriously burn you if you touch it.

You may, for additional safety, want to unplug the printer before opening it for service. This reduces the chance of risk should the LaserJet be accidentally switched on.

Manuals Of Operation

An important measure in your efforts to minimize laser printer troubles is to read the instruction manuals that came with your equipment. This may sound a bit obvious, but you'd be surprised how many LaserJet users never take the time to thoroughly read the operating manual. The manufacturer included the manual so you can get the most out of your expensive purchase. Keep the manual at hand, and refer to it whenever you have a question. The LaserJet manuals provide additional cleaning and maintenance steps you might want to study.

Cleaning Supplies

Stock up on these basic cleaning supplies to keep your printer in tip-top shape. The electrical cleaners can be purchased at Radio Shack or similar electronics store. The remaining supplies can be found at most any drug or department store.

Spray Cleaner Use a mild household spray detergent like Fantastik or 409. Neither leave a sticky residue. Always use a clean cloth or sponge to apply the cleaner.

Cleaner/Degreaser Industrial cleaner for electrical use comes in spray can or bottle form. Basic electrical cleaner is a mixture of Freon and technical grade alcohol, although for environmental reasons, a number of electrical cleaners are coming out that lack the ozone-depleting Freon.

You should never use any petroleum-based cleaner inside your LaserJet. Doing so may cause considerable damage, as the cleaner could deform or even melt plastic parts.

Electrical cleaner, especially those containing Freon, leave no residue, so there's nothing to clean up after use. The cleaner also acts as a degreaser, so you should use it inside your printer with utmost caution. Avoid applying the cleaner to gears or other parts that have been lubricated. Additionally, because of the alcohol in the cleaner, do not apply it to rubber parts. Alcohol dries up rubber; hard rubber in your printer can cause squeaks and paper jams.

Miscellaneous Cleaning Supplies There are a variety of other supplies that may come in handy when maintaining a laser printer:

- Brushes let you dust out dirt. Any good quality painter's or artist's brush will do. Stock a small and wide brush so you can tackle all jobs.
- Photographic bulb brush combines the wiping action of a soft brush with the cleaning action of a strong puff of air. Get the bulb brush at most any photo shop.
- Contact cleaner enables you to clean the electrical contacts in the machine. The cleaner comes in a spray can, but you can apply it by spraying the cleaner onto a brush, then whisking the brush against the contacts.
- Cotton swabs help you soak up cleaner, toner, and paper dust. They are available in quantity at any drug store.
- Sponge-tipped swabs are like cotton swabs, but leave no little pieces of lint behind, are ideal for use when cleaning delicate portions of the printer. The swabs can be purchased at Radio Shack, most electronics stores, and at the cosmetic counter at the drug store.

General Cleaning

When not in use, it's a good idea to place a dust cover over the printer. This makes sense because most printers are used a relatively short period of time each day. Be sure to remove the cover when the LaserJet is switched on. This is especially important with laser printers, as they generate a lot of heat, even when they are not actually printing pages. If you don't want to keep removing and replacing the cover every time the printer is used, at least keep it on overnight.

As always, avoid smoking around your computer gear. The smoke and nicotine can settle on mechanical and electrical parts, making cleaning that much more difficult. The problems of cigarette smoke contamination are exacerbated with laser printers. Smoke settling on the light-sensitive photo conductor drum — used to transfer the image of text and graphics to the page — can reduce its effectiveness, or worse, damage it. The photo conductor drum is the most expensive "consumable" item in a laser printer, and although you must eventually replace it anyway, why rush the matter?

If you must smoke, install a filtered air cleaner near your workstation or use a "smokeless" ash tray.

Even with a cover, dust can never be avoided; some always sneaks by the best protective measures. A soft painter's brush, about 1/2 inch to 3/4 inch wide, can be used to wipe away the loose dust that accumulates on the exterior of the printer. Be sure to get all the nooks and crannies around the switches, paper trays, and ventilation holes.

Hard to reach areas can be cleaned with a can of compressed air, such as that offered by Falcon and Bib (available at most photographic and computer stores). When using compressed air, blow the dust away from the printer; avoid pushing dirt further inside the machine. In place of the compressed air you can use a vacuum cleaner to scoop up the dust. A household vacuum with a soft brush attachment works well, or you can use one of the miniature battery-operated vacuums. However, the small battery-operated vacuums offer little power, and are best for the lightest coat of dust.

If dirt or grime piles up on the exterior of the printer, use a household spray cleaner, like 409 or Fantastik, to wipe up the gunk. Don't spray the cleaner directly on the printer; spray it on a sponge, then apply the sponge to the printer.

Inside Cleaning

Follow the same general steps when cleaning inside the printer. With the exception of the Series IIP, the Series II and III open in a clam-shell fashion; hinged at one end and opening to a large gap at the front or side. The release for the cover is located along the top of the printer. The clam-shell opening assists in changing the toner and other consumable items, as well as clearing paper jams. The LaserJet Series IIP opens from the front. The catch release is located at the right front of the printer, underneath the fold-down Multi-Purpose (MP) tray.

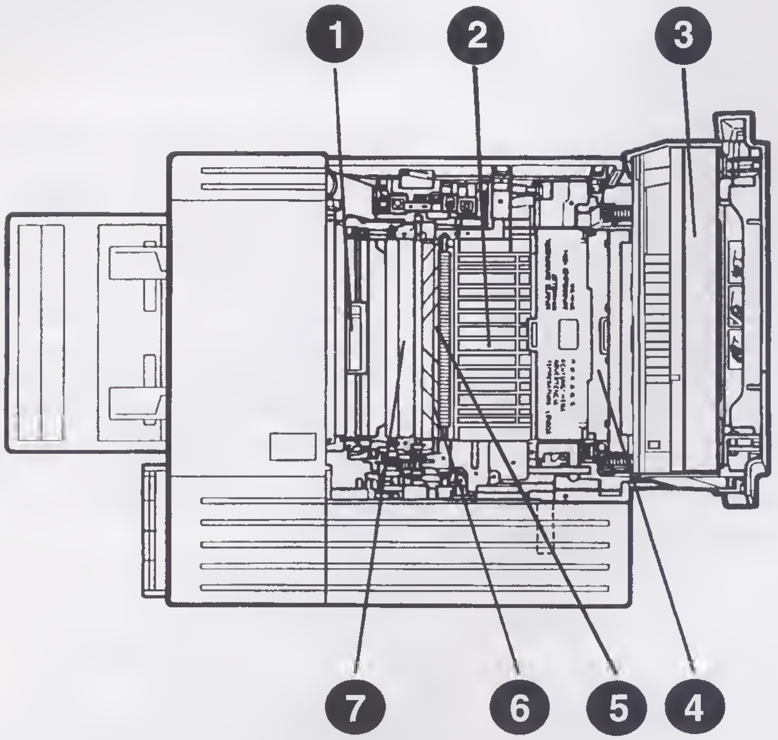
With the shell of the printer open, take a few moments to acquaint yourself with the inside of the machine. Figure 1 shows some of the more important points of interest. Note the position of the rollers, cartridge, fuser, transfer corona wire, and so forth. Avoid touching anything, especially the cartridge unless you absolutely must.

Bear in mind that if there is a problem with your LaserJet, there is little, if any, adjustment or calibration that you can or should make. The nature of the LaserJet inherently leaves few internal controls and adjustments you can safely tweak. In addition, the latest models are designed with few alignment points.

Once the printer is open, use the soft brush to clear away paper dust, loose toner particles, and other contaminates. For best results, clean the inside of the LaserJet every four weeks; every week if the printer is used for more than 100 pages per day.

Use a vacuum to suck the dust out — avoiding using compressed air inside the printer.

When cleaning inside the printer, be on the look-out for small scraps of paper that have been torn off during a paper jam. These scraps may not be in the paper path — so subsequent prints are not jammed as well — but they can cause considerable trouble. For example, a little piece of



1. **Transfer Guide locktray area (with handle)**
2. **Paper feed guide**
3. **Primary corona (in EP-S cartridge)**
4. **Fuser separation pawls (inside rear section of the fusing assembly)**
5. **Anti-static teeth**
6. **Transfer guide**
7. **Transfer corona wire**

Figure 1. Important points of interest inside LaserJet

errant paper may straddle the corona or transfer wires, causing the printouts to be light, or even completely blank! The scraps of paper can also get lodged deeper and deeper inside the printer mechanism, eventually causing a serious jam that cannot be removed except by dismantling the entire innards of the machine. It's a good idea, in fact, to look for pieces of torn paper after clearing every paper jam.

Avoid the use of cleaning solutions inside the printer. They act to remove necessary lubrication. Additionally, if the solution leaves a residue, it could cause problems in operation.

Care Of Cables

The interface cables to your printer should not be kinked or strained. Inspect the cable to be sure the connection is secure between printer and computer. If you use a printer selection device (it should be the electronic kind, not the mechanical type), inspect all of its connections be sure the cables are secured tightly.

After a year or two of service, you may want to remove the cable from the computer and printer, and apply non-residue cleaner to the electrical contacts. The best kind of cleaner to use is the kind made for electrical contacts. "Contact cleaner" is available at Radio Shack and most any electronics outlet store. DO NOT use television tuner cleaner, or any cleaner that leaves a residue.

If the interface cable is too long, wind it loosely. Avoid bundling it in a tight loop. Be sure the cable is not in foot traffic. That includes routing it under carpets. Walking over the cable can deform the insulation, creating shorts and other problems. Tripping over the cable can tug on the connectors, or worse yet, yank your equipment onto the ground.

Cartridge Replacement

The LaserJet uses a replaceable cartridge that includes almost all of the consumable items used in printing pages. The cartridge contains:

- Toner, the black powder that adheres to the page and produces the actual image on the paper.
- Photoreceptor drum, a light-sensitive metallic-coated drum that receives an image from a solid-state diode laser, and reproduces that image onto paper).
- Developing roller, a magnetic roller that transfers the toner to the photoreceptor drum.
- Primary corona wire, a very thin wire that charges the photoreceptor drum with a negative electrical charge.

When replacing the toner cartridge in a LaserJet, be sure to follow the directions that come with the cartridge. You will need to clean the printer and replace certain parts along with the cartridge. The basics of changing the cartridge are:

1. Open printer.
2. Pull out old cartridge; discard or recycle.
3. Gently shake new cartridge to distribute the toner.
4. Insert cartridge into printer.
5. Remove sealing tape from cartridge.
6. Clean transfer guide.
7. Remove old fixing pad.
8. Clean fusing roller.
9. Install new fixing pad.
10. Clean transfer corona wire.
11. Close printer.

While replacing the cartridge, take the time to do a little bit of extra cleanup inside the printer. You will especially want to remove any extra loose toner that may have escaped from the cartridge or rubbed off the paper. Check around the fuser compartment (when the printer has cooled down) for surplus toner.

Loose toner can most easily be removed from the inside of the printer with a very slightly dampened lintless cloth. The cloth should not be over wet; it you can squeeze any moisture out of the cloth, there's too much water in it.

Cleaning The Transfer Corona Wire

The transfer corona wire transfers toner from the photo conductive drum to the paper. It often picks up a great deal of toner and other dirt, and should be routinely cleaned, at least at every cartridge change. If you do a lot of printing, or double-sided pages on your Series IID or IIID, you may need to clean the transfer corona wire more often.

Using the little green brush that's tucked to the left of the paper path area, brush away the toner and other debris from the corona wire and the surrounding channel. Be sure to clean the following areas:

1. The transfer wire itself.

2. In and around the transfer wire channel.

3. The insulating pads located on either end of the transfer corona wire.

4. The corona protector wires, which string diagonally across the channel.

For caked-on grime, dampen a cotton swab with isopropyl alcohol (wet, not dripping), and carefully clean the wire. **USE CAUTION:** You don't want to break the transfer corona wire. If you do, your LaserJet must be serviced. The transfer corona wire can be readily replaced by a service technician, but the cost is not trivial.

Cleaning The Primary Corona Wire

The primary corona wire is located inside the toner cartridge. Its job is to electrically charge the photo conductive drum so that it attracts toner at all the right places.

To clean the primary corona wire you must first remove the EP cartridge from its housing inside the printer. Keeping the cartridge upright, locate the slot that covers the primary corona wire. The wire inside is protected by a length of black plastic. Using the green brush that is stored along the inside left edge of the printer, insert the felt-tip end into the slot. The brush is inserted so that the felt points AWAY from the label on the top of the cartridge.

Slide the brush back and forth carefully a few times to clean the wire. When done, replace the toner cartridge, and put the brush back into its place.

CAUTION: Clean the primary corona wire very carefully. If it breaks, the entire toner cartridge must be replaced.

Cleaning The Paper Guide Path

With a clean, dampened cloth (use water), wipe away any dirt or grime that has collected along the paper path. Be sure to clean the paper path in front of, as well as behind, the fuser assembly (the fuser is covered with a fire-retardant green felt).

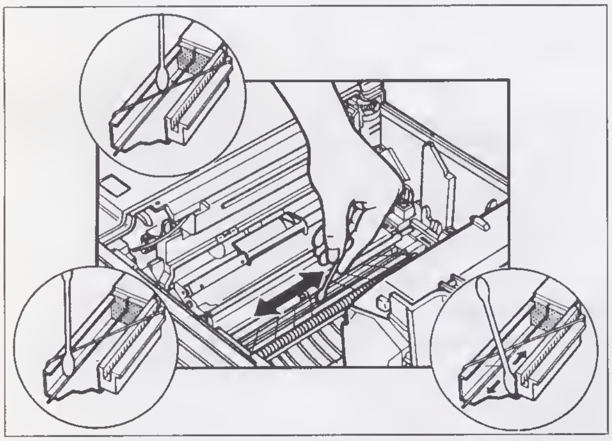


Figure 2. Cleaning the Transfer Corona Wire area

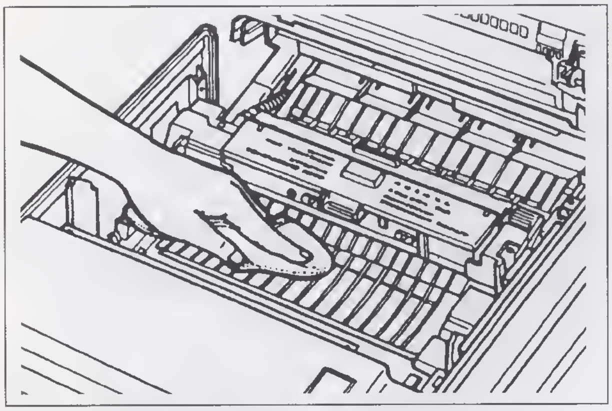


Figure 3. Cleaning the Paper Feed Guide

Cleaning The Transfer Guide And Lock Tray

The transfer guide and transfer guide lock tray are located toward the front of the printer. The guide and lock tray collect paper dust and should be regularly cleaned. You can use most any clean, lintless cloth. If needed, wipe the transfer guide with a damp cloth. Use water only.

Lift the guide lock (grasp it by the green handle) and clean underneath the lock tray. Paper dust and dirt can accumulate under there as well.

Cleaning The Fuser Assembly

Open the lid to the fuser assembly, and lift out the fuser roller cleaner. This cleaner is replaced at every cartridge change. **DO NOT** continue using the old cleaner even though you have replaced the cartridge. After time, the print results will become very poor.

If you are maintaining the printer between changes, use a damp cloth and wipe away excess caked-on toner from the felt backing cleaner. Use the cloth to clean inside the fuser assembly. Visually inspect the fuser roller: it should be free of toner. If toner remains on the roller even after you attempt to clean it, it could indicate that the toner has fused to the metal bar. You may need to return the LaserJet for service.

The back of the fuser assembly should also be routinely opened so that you can clean inside there as well. Gently push the back of the fuser assembly toward the rear of the printer. You will see inside a series of rollers and four black separation pawls (claws). Use a damp cloth to clean the rollers, making sure you clean the tips of each of the pawls. Avoid coming into contact with the metal rollers inside the fuser. They can be extremely hot, even if the printer has been used to recently print just a page or two.

Printer Lubrication

During normal use, your LaserJet should seldom require lubrication. However, if lubrication is called for — parts squeak even after you've changed the toner cartridge, be sure to follow the manufacturer's recommended oiling procedure. Check the LaserJet operations manual for more information. Generally, you will lubricate the bearings of paper rollers only (but not the rollers on the fuser section).

DO NOT lubricate pulleys, cables, other components that rely on friction for proper movement or activation. And especially be wary of getting oil on or near the photoreceptor drum, fuser, corona, or transfer wires. For obvious reasons, oil placed too close to the fuser section may cause a fire.

You can use most any common machine oil for lubrication. The oil should not have anti-rust chemicals in it. A graphite-based oil should be avoided because the dark color can smudge the printouts. Suitable lubrication oils are available at Radio Shack stores, industrial outlets, and most electronic stores.

NEVER use an oiless lubricant such as WD-40. The spray is non-conductive. If you accidentally spray it on electrical contacts, your printer may be inoperative.

ElectricalContact Cleaning

It's rare that the electrical contacts inside the printer will need cleaning other than a quick whisk with the green contact brush that is stored inside the printer.

However, heavy use of the printer or failure to periodically clean the electrical contact may make a more thorough scrubbing necessary. The most critical electrical contacts in the LaserJet are located on the far left edge of the machine, and connect the printer with the toner cartridge. You will see three spring contacts, a set of flat metal contacts.

Normally, you need only clean these contacts with the contact brush provided with the printer (the brush is stored to the immediate right of the contacts). If needed, spray a small amount of non-residue contact cleaner onto these metal contact points. Allow to evaporate completely (3-5 minutes) before closing the printer and turning it on.

As most contact cleaner is in spray form, the spray may squirt the cleaner to an overly large area. If you don't want this, spray the cleaner into a cotton ball or swab, then use the cotton as an applicator. Be sure to leave no lint from the cotton on the contacts. If cotton threads are a problem, purchase some sponge-tipped applicators. Most electronics and many record stores sell them. For very hard to reach places, use the extension nozzle tube.

AdjustingPrint Density

Over time (especially as the toner in the cartridge is depleted) your printouts may take on a washed-out look. The LaserJet provides a means to increase or decrease print density. The print density knob is located under the left front lip of the inside of the printer. The green knob is numbered 1 - 9.

- The higher the number, the lighter the print. Set at 9 the LaserJet will print very lightly.
- The lower the number, the darker the print. Set at 1 the LaserJet will print darkly, perhaps filling in characters and graphics (and also using up more toner than necessary.

For general use, dial the knob to 5. If the print is too dark or too light, increase the setting by one notch and try again. Note that you should avoid tampering with the print density knob until you notice a consistent problem with print density, and only after you have used a new cartridge for more than 200 pages or so. New cartridges have a "break-in" period of about 200 pages, and may print lightly in the interim.

Cleaning The Ozone Filter

The LaserJet Series III models incorporate an ozone filter to trap the ozone gas that is created during printing. This gas is generated by the high voltage corona wires, and cannot be totally eliminated. However, it's important to filter it as ozone (despite it's usefulness in upper atmosphere) is a toxic and corrosive gas.

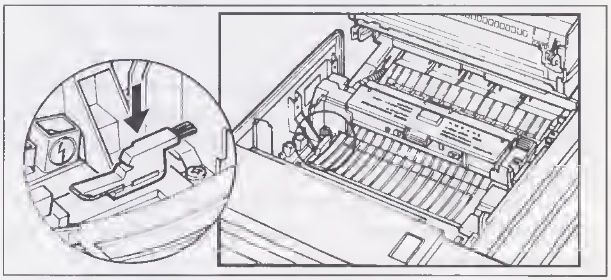


Figure 4. Cleaning brush location

Hewlett Packard recommends that you clean the ozone filter every 50,000 pages — about every two years under normal use. The filter is located inside the printer, and is accessible when the clam sheet cover is open. You'll find it along the right side of the printer, toward the back.

To replace the filter, flip the filter cover down, and slide out the filter by grasping the clear plastic tab. Throw the old filter away and replace it with a new one. Flip the cover up and close the printer.

Final Inspection

Before you close the laser printer, double-check your work. Like the bumbling surgeon who leaves objects inside his patient after an appendix operation, don't leave tools, hardware, used cotton swabs, or cleaning supplies inside the chassis of the printer. Check to make sure that you have properly replaced ALL parts.

Keeping good care of your LaserJet is not hard, and it requires no special tools. By taking just a few moments every week or two, you can keep your laser printer in tip-top shape. That means better printouts and less headaches.

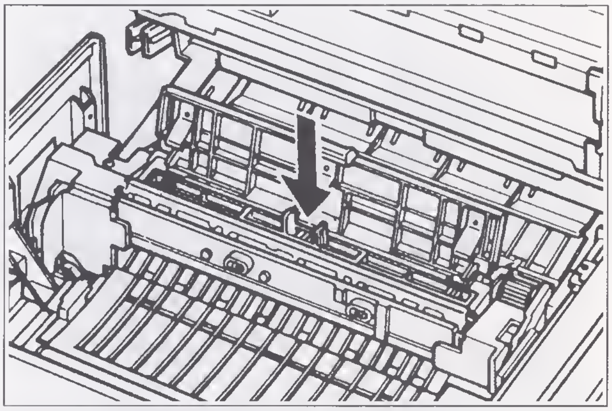


Figure 5. Replacing the Cleaning Pad

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TROUBLESHOOTING GUIDE

Its Sunday night; your report is due Monday morning. Every page prints out with a large void in the center where the type should be. Here's what to do about it and more!

The LaserJet is a hearty machine, and under normal use doesn't require special attention. Every once in a while, though, things may go haywire and printing will be interrupted.

Paper may jam, or the pages may come out blotchy, light, or even completely blank. This section details the steps you can do to minimize problems with your LaserJet, and how to cope with them when problems do occur.

Dealing With Paper Jams

Nothing is more annoying that halting your regular work to clear a paper jam in your laser printer. An occasional jam — every two or three hundred pages, for example — is to be expected, especially if the laser printer is more than a few years old. But if you are experiencing more frequent jams, it may be an indication that your laser printer needs a thorough cleaning. It could also indicate you are using paper of sub-standard quality, or that the printing mechanism is worn out, and should be overhauled.

If you feel your laser printer is jamming too often, take the time to clean it, both outside and in. Be on the lookout for shredded pieces of paper that may be impeding the smooth flow of paper during printing. If you are removing a jam, inspect the paper and look for torn edges or corners. If the paper has been damaged, try to locate the remaining portions inside the printer. Most likely, it is these errant scraps of paper left over from previous jams that cause future problems.

If the jams still occur, try replacing the toner cartridge. If the old cartridge is still good, wrap it tightly in a dark garbage bag, and place it out of the way so that it won't be tipped over or disturbed.

Persistent jams may be caused by poor quality paper, or paper that is not really designed for use in laser printers. Cheap paper can curl excessively in the fuser, causing jams that are particularly hard to clear, since the fuser is a self-contained unit, and runs VERY HOT during printing. If you are clearing a fuser jam, open the printer and wait until it cools down a bit. Otherwise, you could be seriously burned.

Heavy, linen letterhead stock may jam regularly in your printer, unless the paper is specifically made for use with plain paper copiers or laser printers.

Try a different type or brand of paper to see if jamming still occurs. Like spoiled household cats, some laser printers are more finicky than others, and you may need to try a sampling of several types and grades of paper before you find one that's just right for your machine.

Stubborn jamming may be an indication of worn out parts. Other than the consumables such as drum, toner, and developer, few laser printers use parts you can easily replace. If your printer is getting on in age, and jams are commonplace, you'll need to take your laser into a repair shop.

A Look at the Paper Transport

Figure 6 shows the side-view of a LaserJet printer, and how the paper feeds through the mechanism. Note that the paper can eject at the back, if you've lowered the rear output dray, or out the top if the rear output tray is closed. You should lower the rear output tray if you are printing on labels, envelopes, and other heavy stock. Regular paper can be ejected out the top of the printer.

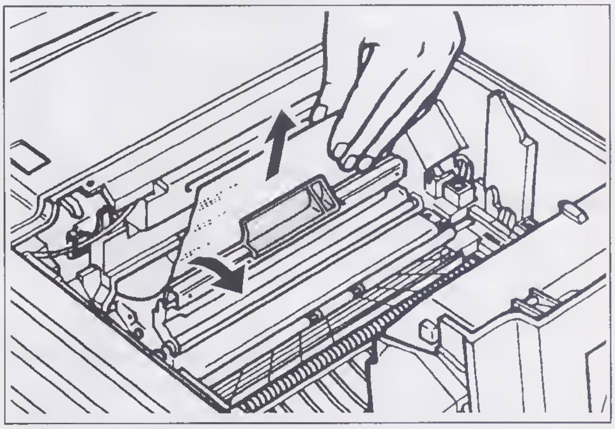

Figure 6. Clearing the Paper Feed Path (Rear View)

The four most common areas for paper jams are:

- The paper pick-up area, where rubber rollers grab a single sheet of paper and feed it through the printer.
- The transfer guide area, directly under the EP cartridge, where toner is deposited onto the paper.
- The fuser area, where the toner is adhered to the paper.
- The paper exit path area, where the paper leaves the printer.

Clearing the Jam

Should a jam occur, wait until all motor activity in the LaserJet has stopped. Read the LCD panel; it should indicate a jam. The jammed paper must be removed before printing can continue:

1. Open the top of the printer.
2. Locate the jammed paper and carefully remove it.
3. Look for torn parts of the paper, and remove these as well.
4. Close the printer.

If you have selected AUTO CONT=ON, printing will automatically resume once the jam is cleared. If the AUTO CONT is off, you'll need to press the CONTINUE button to re-initiate printing.

Be aware that portions of the paper that have already been imaged, but not yet fused, will be coated with toner. This toner will come off easily, so handle the paper with care. Wash your hands to remove any toner that has touched your skin. Toner isn't necessarily dangerous, but it can smudge and stain clothing and paper.

Use caution when removing paper from the fuser area. The fuser can become very hot during operation, and poses a burn hazard.

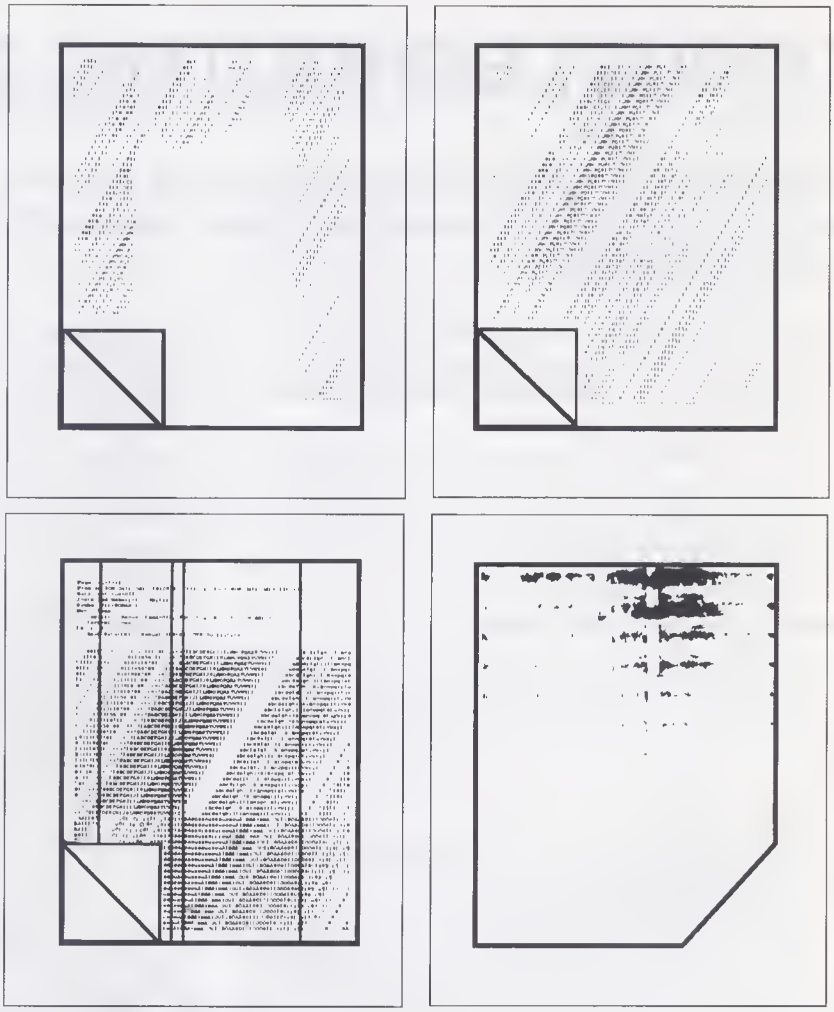

Figure 7. Printing errors

Ghost Pages

A ghost page is a piece of paper that sticks to another page while feeding through the printer. You end up with one printed page, and a blank page. Sometimes, more than two pieces of paper stick to one another, and you get multiple ghosts. Ghost pages can cause jamming, because of the extra bulk passing through the printer. But usually, they are an annoyance and a waste of paper.

You can reduce or minimize ghost pages by doing the following:

- Be sure to fan the paper adequately when inserting it into the paper tray. This helps separate any pages that may be clinging.
- If the weather is dry, the paper may be clinging due to static. There's not much you can do to reduce the static, other than fanning the paper, but you can reduce the dryness in the air with a humidifier.

Diagnosing Printing Problems

Other than paper jams, the most common problem with laser printing is light or blank pages. Fortunately, these can be easily corrected. Watch especially for these problems:

- Print is too light: Toner level low.
- Print is uneven: Toner not evenly distributed in the cartridge.
- Page is only partially printed: Dirty transfer wire.
- Page is completely blank: No toner, or dirty corona wire.

Note that print quality is generally low immediately after cartridge replacement. The print may not be sufficiently dark or even until after the first 100 or 200 prints.

Following are specific remedies for a half-dozen common printing ailments. Note that the LaserJet is a complex piece of machinery; more than one problem may produce a certain symptom. If the problem remains even after following the steps outlined below, refer to the LaserJet manual or your dealer.

Large Void in Center Area of Page

A large void in the center area of the page indicates that the toner supply in the EP cartridge is low. Check the LED readout: it will probably indicate that the toner is low. You should replace or refill the cartridge at this time. Operating the LaserJet with the toner level low is not recommended, as it can cause excess toner deposits on the fuser roller.

If you don't have a replacement cartridge nearby, and absolutely must print the last 10 pages of an important report, you can sometimes squeeze out a few more acceptable pages by doing the following:

1. Turn the printer off.
2. Open the printer and remove the EP cartridge.
3. While holding the right and left sides of the cartridge, gently rock it forward and back (not side to side). Do this about 6-10 times.
4. Replace the cartridge, close the printer, and turn it back on.

Depending on the reserve toner in the cartridge, you may be able to print an additional 10 to 25 pages before the void reappears. You may also want to temporarily increase the print density adjustment (located in the front left of the printing compartment, when the printer is open). Return the density to its original position when you replace the EP cartridge.

Drop Outs

Small white blotches in the printing are indicative of paper containing moisture. Check the paper. If the paper is wet, or feels damp, replace it with new paper. Do not attempt to dry out the paper, as it will wrinkle and cause printer jams. Recycle this paper or cut it up and use it for a scratch pad.

Splotches can also indicate a dirty transfer corona wire. Clean the wire as indicated in "LaserJet Upkeep," elsewhere in this issue.

Half-Printed Page

A dirty transfer corona wire is the usual cause of an incompletely printed page. Usually, the first half of the page will print okay (or too light), and the second half will be very light or completely blank. The transfer corona wire can be readily cleaned, as described in "LaserJet Upkeep," elsewhere in this issue.

Vertical Streaks

One or more vertical streaks (Figure 7) indicate:

- A damaged drum inside the EP cartridge
- A dirty or worn fuser roller.

Occasionally, the streaks will go away by themselves after a dozen or so prints. Should the streaks persist, clean the fuser roller with a cotton ball, and redistribute the toner in the cartridge in the following manner:

1. Turn the printer off.

2. Open the printer and remove the EP cartridge.

3. While holding the right and left sides of the cartridge, gently rock it forward and back (not side to side). Do this about 6-10 times.

4. Replace the cartridge, close the printer, and turn it back on.

If these measure fail, install a new EP cartridge, or return the LaserJet for service.

Black Blotches or Staining

Ugly black blotching typically indicate dirty rollers inside the printer, particularly at the fuser section. Remove the fuser roller cleaning pad and inspect it. If it looks unusually dirty, replace it and clean the fuser roller.

Repeating Dots or Scratches

Repeating dots or scratches are blemishes that appear at equal intervals along the length of the page.

- Blemishes that are spaced approximately four inches apart are most likely caused by damage to the drum inside the toner cartridge.
- Blemishes that are spaced approximately 2-3 inches apart are most likely caused by dirty transport rollers or a dirty fuser roller.

Defects in the photoconductor drum inside the EP cartridge usually call for replacement of the cartridge. The cartridge should not be recycled, as the defect could remain. The fuser roller and fuser roller cleaning pad should be cleaned, as needed.

Reviewing Laserjet Print Quality

Problems with the LaserJet don't always mean a major malfunction, print jam, or obvious print inconsistency. From time to time, you should make test prints to ensure that your LaserJet is in tip-top shape and making the best prints possible. Use the documents to make a series of prints, and save the prints for future reference. Look for:

- Richness of tone — The toner should be sold and black, not a mottled gray. Look especially in large text or graphics.
- Smears — Uneven toner coverage could indicate wear. Much of the effects of wear can be reduced or eliminated by replacing the EP toner cartridge (preferably with a brand new cartridge, and not a refilled one).
- Voids — White areas on the page indicate poor toner coverage because of insufficient toner supply, or a dirty transfer corona.
- Specks — Blotches of toner typically mean that the interior of the printer is dirty, and should be clean.

CHOOSING PAPER

In this section you'll learn about selecting and using paper with the LaserJet. Using the proper paper goes a long way to ensuring trouble-free operation of the printer.

The paper you use in your LaserJet plays an important role in the quality of prints you obtain. Inferior paper has a tendency to curl and jam in the machine, and may not take the toner as well as it should. Good quality paper needn't be expensive, and goes a long way in improving the looks of your printouts. Following are some things you should know about paper for the LaserJet (as well as any other laser printer).

Paper Size

Paper comes in standard sizes. In the US, standard paper sizes are letter and legal. The LaserJet can accommodate both. In addition, the printer can use the European A4 paper size, and a special Executive paper size. The actual dimensions for these paper sizes are:

Paper Size	Dimensions (inch)	Dimensions (mm)
Letter	8.5 x 11	215.9 x 279.4
Legal	8.5 x 14	215.9 x 355.6
A4	8.26 x 111.69	210 x 297
Executive	7.16 x 10.12	182 x 257

Table I. Paper Sizes

The LaserJet requires a separate paper tray for each paper size, or jams could occur. However, you can adjust the manual feed tray to accept the four paper sizes, plus envelopes. The paper tray slides expand from 3 1/2-inches to 8 1/2-inches.

Be sure that the paper is the proper size before use; measure it if necessary. A deviation of a fraction of an inch here or there, won't make any difference. But letter-size paper cut down to 8 1/4 inches or so, for example, could cause misfeeds.

Paper Weight

Besides size, paper is graded by weight. Most papers for laser printer use are 18 to 20 pound (abbreviated #). The weight of paper is determined by weighing a stack of it, usually a ream (about 500 sheets). The paper is cut to a standard size before weighing, so the physical dimensions of the paper are not a factor.

Thinner, lightweight papers have a weight of 16 or 17 pound, and bulky papers have a weight of about 35 pound. This limited range is the approximate minimum and maximum paper weight that the LaserJet can handle. When printing with lighter or heavier paper, the LaserJet could gag and a jam could occur. If you need to print on heavier paper, make an original on standard weight paper (20#), then have it duplicated on a copier that accepts heavier stocks. A number of high-speed xerographic copiers can accept paper weights up to 65 pounds.

In addition to the weight of the paper, also note its caliper, or thickness. A paper may be very dense, and therefore heavier than normal, but may be too thin to adequately feed through the printer mechanism. For best results, use a paper with a caliper of 3.7 to 7.5 mils. Most all bond and letterhead paper readily fall into this range. Some envelopes may not, however, because of their many layers of paper. You should avoid using bulky envelopes in the LaserJet, as these may easily jam.

Paper Content

You can use the same paper for your laser printer as you do for your photocopier, which makes it easy to find. Common laser/photocopy paper is made of wood pulp, called bond, with no cotton or "rag" content. Bond paper is suitable for most copy applications, but if you need a better look and feel, load the copier with a rag-content paper, like the kind used in letterhead. Avoid fancy linen or all cotton papers; these may misfeed. Be sure the edge of the paper is smooth and clean. If the paper has a ragged edge, it may not pass through the machine properly.

Color Paper

Color paper can be used to separate sections of reports, or to indicate the level of revision of a document. Most all color papers, except construction art paper, can be used with the LaserJet.

Note that the color in some papers are not colorfast. If they are exposed to moisture or heat, the colors may fade, shift, or bleed. Be sure the colors are permanent or you may not obtain the results you are looking for. Worse, the colors may rub off inside the printer. The residue must be cleaned or subsequent copies may be tinged with color.

White paper comes in grades of whiteness. Brite-white paper is often made by mixing ultraviolet optical brighteners with super-bleached pulp. Most people prefer a more subdued white paper, because it is easier on the eyes. If you need a specific brightness, check with the local stationary or paper supply store.

Paper Quality

Experts can judge the quality of paper by touch, sight, even smell. Unless you have specific training, it's difficult to tell a "good" paper from a "bad," paper. But you can evaluate a given paper by using it for a while in your LaserJet. Buy a ream (or less if you can) of several brands and try each. Note how well the LaserJet accepts the paper, and whether the print quality gets better or worse.

When choosing paper, try to compare a new sheet with the sample sheet. Apart from a little bit of soil left behind from handling, the sample should look like the fresh sheet. Be especially on the lookout for yellowing. Also examine how well the sample has stood up to being handled. Most bond papers will show creases and dog ears rather easily, but a good rag content paper will hide them.

Paper Finish

Bond paper has a smooth, even texture. Holding it up to the light, you can see the splotches of pulp from manufacture. The smooth finish is what makes bond paper ideally suited for laser printing. The toner sets evenly on the surface of the paper, with no distortion.

Paper with some rag content will have a definite texture, perhaps even a linen weave. This texture, while making the paper "feel" better in your hands, may actually produce inferior results on the LaserJet. If you want to use a rag paper, get on that has little surface texture. Avoid highly polished papers (like slick magazine pages), as the toner may not set well on the surface. You can test this by making a sample copy and rubbing the page with your finger. Little or no toner should rub off.

WILD STEVE HAS OPENED A NEW STORE IN SOUTH WATERS
THE ANNUAL ...ME CORP ...PANY PICNIC
Golf Tournament
Please Join Us
PRESENTATION OF MONTHLY SALES OVERVIEW
WATER COLORS SPA & RESORT

Figure 8. Paper Choices

Remember that cotton rag papers have a higher moisture content than plain bond paper (the cotton absorbs moisture much more readily). When this moisture is driven out by the fuser heater in the printer, and causes the paper to curl. If the curl is excessive, it may remain there forever, and will detract from the finished product. Also, on the LaserJet Series IID and IIID, which include a duplex (two sided) print capability, the curled paper may get jammed when printed on the second side.

You should avoid any paper with an uneven (feathered) edge. The edge will cause jams and will litter the insides of the printer with paper debris.

Curl

Paper normally has some moisture in it, even though it may feel dry as a bone. The heat and pressure of the LaserJet's fuser can remove some of that moisture, which results in paper curling. Since paper curl is a natural phenomenon, and little can be done about it, the LaserJet is designed to work around it.

To minimize curl, the paper is cut so that its "grain" is lengthwise. That causes the paper to curl on the sides after it comes out of the LaserJet, rather than the top or bottom, which could cause jams. In addition, the paper is made to curl one way only; generally away from the printed side. This is why it is important to load the paper into the LaserJet curl down. Almost all paper makers package the paper in the box so that the curl is pointing down when the label is held upright.

Cotton-content papers can curl more than wood pulp papers. For this reason, you may experience more paper jams with letterhead paper than with standard printer paper. You can minimize curls — and jams — by purchasing cotton-content papers designed for copiers and laser printers.

Clay Coated Paper

Clay coated paper is often used when typing or printing a document for reproduction. The smooth clay coating provides an even surface for the ink. Clay coated paper, as long as it is not too thick, can also be used in the LaserJet, for producing originals for reproduction (xerography, offset printing, etc.). However, the slickness of the paper may cause more paper jams, so be on the lookout for these. In addition, clay coated paper leaves behind more paper debris, so you'll need to clean the printer more often.

Trying Out Paper

Whenever possible, get a sample of 100 to 200 sheets of several brands and qualities of paper. Try each of them to see what affect they have on your laser. This applies to both bargain paper and specialty paper. Don't place an order for 25 reams of a paper without testing it first, because it may not be compatible with your copier. Most paper dealers will supply you with sample sheets for testing purposes.

Paper Specifications

Hewlett-Packard has defined a set of paper specification for use with the LaserJet series of printers. These specifications are shown in Table 1. You will want to follow these specifications as much as possible when buying and using paper for your LaserJet, however bear in mind that these specifications apply to most commercial grades of paper, so no extra consideration on your part is necessary.

Table 1. Paper Specifications

Weight	16 to 35 lb.
Composition	Bond paper: 100% chemical wood pulp and/or cotton; paper should not contain excessive amounts of clay or talc
Caliper	3.7 to 7.5 mils
Moisture content	4-6 percent
Smoothness	100 to 300 Sheffield
Acid content	5.5 pH minimum, to 8.0 pH
Heat resistivity	To 200 degrees Centigrade for 0.1 seconds
Finishing dimensions	+/- 0.0313 inch
Grain	Long
Paper size	3.5" to 8.5" wide; 7.5" to 14" long
Ash content	Not to exceed 10%
Curl	No allowable curl printed side; minimum 15 inch radius of curvature on opposite side

If you are merely interested in the best paper possible, Hewlett-Packard suggests (but does not necessarily recommend) the following papers:

Paper	Type
Canon NP	Bond
Xerox 4024	Bond
Gilbert Neu-Tech	Cotton (rag)
Neenah NP	Cotton (rag)

Caring for Paper

Just using the proper paper isn't enough: you must be sure to store and load it properly.

·Store all paper in a dry, dark area, preferably in the original shipping box or wrapper.

·Keep paper away from sources of moisture or heat.

·Retain the label on the paper wrapper; it indicates the orientation of the paper for loading into the paper.

DISCOUNT PRICE GUIDE

A DIRECTORY OF LOWEST PRICES NATIONWIDE

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Dealers 88

The Discount Price Guide staff regularly scans the country for the lowest prices available within each product category. They continually monitor newspaper and magazine advertising and maintain an ongoing phone dialog with outlets across the country. At the last moment before press time, the computer selects the lowest prices for each category. Due to the lead time necessary for the issue to reach the newsstands (several weeks), and the volatile nature of the discount marketplace, prices can fluctuate marginally up or down.

HARD DISK DRIVES

MAKE/ MODEL	CAPACITY (Mb)	SPEED (ms)	CONTROLLER	STREET PRICE	DEALER
ESDI					
Micropolis					
MC1664	340	14	N	$929	Storage Devices Inc.
MC1664	340	14	N	985	JB Technologies
MC1664	340	15	N	989	Upgrades International
MC1568	660	16	N	1,245	Storage Devices Inc.
MC1568	660	16	N	1,298	JB Technologies
MC1568	660	16	N	1,498	Upgrades International
Micropolis					
MC1518	1340	14	N	2,289	Storage Devices Inc.
MC1518	1340	14	N	2,369	JB Technologies
IDE					
Conner					
CP3000	40	25	N	159	DC Drives
CP3000	40	25	N	165	Computer Products Corp.
CP3000	40	25	N	169	Quick Electronics
CP3000	40	25	Y	215	Computer Products Corp.
CP3000	40	25	Y	219	MegaHaus
Seagate					
ST351A	40	28	N	159	Computer Products Corp.
ST351A	40	28	N	169	Upgrades International
ST351A	40	28	Y	199	Computer Products Corp.
ST351A	40	28	Y	209	Hard Drives Int'l
Conner					
CP30084	80	17	N	208	Computer Products Corp.
CP30084	80	19	N	228	Upgrades International
CP30084	80	17	Y	265	Computer Products Corp.
Maxtor					
7080	80	17	N	207	Computer Products Corp.
7080	80	17	N	258	Upgrades International
Western Digital					
WD2080	80	15	N	239	Hard Drives Int'l
WD2080	80	15	N	258	Upgrades International
Seagate					
ST3120A	105	15	N	229	Computer Products Corp.
ST3120A	105	15	N	259	MegaHaus
ST3120A	105	15	Y	279	Computer Products Corp.
Conner					
CP30104	120	19	N	275	Computer Products Corp.
CP30104	120	19	N	298	Quick Electronics
CP30104	120	19	N	298	Upgrades International
CP30104	120	19	Y	329	Computer Products Corp.
Maxtor					
7120	120	15	N	256	Computer Products Corp.
7120	120	15	Y	329	Computer Products Corp.
7120	120	15	Y	339	Hard Drives Int'l
Western Digital					
WD2120	120	15	N	$318	Upgrades International
WD2120	120	14	Y	349	Hard Drives Int'l
Seagate					
ST3144A	130	15	N	266	Computer Products Corp.
ST3144A	130	16	N	269	Quick Electronics
ST3144A	130	16	N	279	Upgrades International
ST3144A	130	15	Y	309	Computer Products Corp.
ST3144A	130	15	Y	329	Hard Drives Int'l
Conner					
CP30174	170	17	N	307	Computer Products Corp.
CP30174	170	17	N	319	Hard Drives Int'l
CP30174	170	17	Y	357	Computer Products Corp.
CP30204	210	16	N	359	Hard Drives Int'l
CP30204	210	12	N	420	Computer Products Corp.
CP30204	210	12	Y	479	Computer Products Corp.
CP30204	210	16	N	486	Upgrades International
CP30204	210	15	N	510	Storage Devices Inc.
Maxtor					
7213	210	15	N	362	Computer Products Corp.
7213	210	15	N	408	Upgrades International
7213	210	15	N	479	Hard Drives Int'l
Western Digital					
WD2200	210	12	N	399	Hard Drives Int'l
WD2200	210	15	N	535	Upgrades International
Quantum					
LPS240A	240	16	Y	599	Hard Drives Int'l
LPS240A	240	16	N	629	Computer Products Corp.
LPS240A	240	16	Y	679	Computer Products Corp.
Seagate					
ST3283A	245	12	N	484	Computer Products Corp.
ST3283A	245	12	N	499	Hard Drives Int'l
ST3283A	245	12	Y	539	Computer Products Corp.
ST3283A	245	12	N	569	Upgrades International
Maxtor					
LXT340	340	13	N	629	DC Drives
LXT340	340	12	N	679	Hard Drives Int'l
LXT340	340	13	N	738	Upgrades International
Seagate					
ST1480A	425	14	N	829	Computer Products Corp.
ST1480A	425	14	Y	879	Computer Products Corp.
ST1480A	425	14	N	1,136	Upgrades International
Fujitsu					
M2624	510	12	N	969	Quick Electronics
M2624	510	12	Y	989	Hard Drives Int'l
Conner					
CP3544	540	12	N	922	Computer Products Corp.
CP3544	540	12	Y	972	Computer Products Corp.

For dealer addresses and phone numbers see page 88 *NA denotes not available*

STREET PRICE GUIDE: HARD DISK DRIVES

MAKE/ MODEL	CAPACITY (Mb)	SPEED (ms)	CONTROLLER	STREET PRICE	DEALER
CP3544	540	12	N	$989	Upgrades International
SCSI					
Conner					
CP30100	120	18	N	295	Storage Devices Inc.
CP30100	120	18	N	319	DC Drives
CP30100	120	19	N	323	Computer Products Corp.
CP30100	120	19	Y	569	Computer Products Corp.
Maxtor					
MX7213S	210	15	Y	419	Hard Drives Int'l
MX7213S	210	15	Y	509	MegaHaus
Seagate					
ST3283N	245	12	N	549	Computer Products Corp.
ST3283N	245	12	N	684	Upgrades International
ST3283N	245	12	Y	749	Computer Products
Maxtor					
MX340	340	13	Y	689	MegaHaus
MX340	340	12	Y	849	Hard Drives Int'l
Micropolis					
MC1684	340	15	N	1,078	Upgrades International
MC1684	340	15	Y	1,249	Hard Drives Int'l
Quantum					
PRO425S	425	14	N	1,057	Computer Products Corp.
PRO425S	425	14	Y	1,257	Computer Products Corp.
Fujitsu					
FJ2624	520	12	N	989	DC Drives
FJ2624	520	12	N	999	MegaHaus
FJ2624	520	12	Y	1,099	Hard Drives Int'l
FJ2624	520	12	N	1,999	Quick Electronics
M2624F	520	12	N	1,028	Upgrades International
M2624F	520	12	Y	1,129	DC Drives
Conner					
CP3540	540	12	N	890	Computer Products Corp.
CP3540	540	12	Y	1,090	Computer Products Corp.
CP3540	540	12	N	1,139	Upgrades International
Micropolis					
MC1624	665	14	N	1,179	DC Drives
MC1624	665	14	N	1,199	MegaHaus
MC1624	665	14	N	1,199	Quick Electronics
MC1624	665	14	N	1,244	Upgrades International
MC1624	665	15	Y	1,349	Hard Drives Int'l
Seagate					
ST4766N	675	15	N	1,199	Computer Products Corp.
ST4766N	675	15	N	1,258	Upgrades International
ST4766N	675	15	Y	1,399	Computer Products Corp.
Maxtor					
PO 12S	1025	13	N	1,459	Storage Devices Inc.
PO 12S	1025	13	N	1,479	MegaHaus
PO 12S	1025	13	N	1,489	Computer Products Corp.
PO 12S	1025	13	Y	1,689	Computer Products Corp.
PO 12S	1025	13	N	1,738	Upgrades International
Micropolis					
MC1598	1050	14	N	1,499	Storage Devices Inc.
MC1598	1050	14	Y	1,529	MegaHaus
MC1598	1050	14	N	1,694	Quick Electronics
MC1598	1050	14	N	1,694	Upgrades International
MC1598	1050	14	Y	1,789	Hard Drives Int'l
Seagate					
ST41200	1050	15	N	$1,399	Computer Products Corp
ST41200	1050	16	N	1,405	Storage Devices Inc.
ST41200	1050	15	Y	1,599	Computer Products Corp
ST41200	1050	15	N	1,684	Upgrades International
Fujitsu					
FJ2266S	1080	14	N	1,428	Quick Electronics
FJ2266S	1080	12	N	1,449	Storage Devices Inc.
FJ2266S	1080	14	N	1,499	Hard Drives Int'l
FJ2266S	1080	14	N	1,518	MegaHaus
Hewlett Packard					
HP2247	1100	12	N	1,899	DC Drives
HP2247	1100	12	N	1,899	Hard Drive SuperSource
HP2247	1100	12	Y	2,039	DC Drives
Micropolis					
MC1528	1340	14	N	1,739	DC Drives
MC1528	1350	14	N	1,769	MegaHaus
MC1528	1350	14	N	1,799	Hard Drives Int'l
MC1528	1350	15	N	1,826	Upgrades International
Seagate					
ST41650N	1420	15	N	1,849	Storage Devices Inc.
ST41650N	1420	15	N	1,899	Computer Products Corp
ST41650N	1420	15	N	1,999	Hard Drives Int'l
ST41650N	1420	15	Y	2,099	Computer Products Corp
Maxtor					
PO 17S	1470	13	N	1,699	Computer Products Corp
PO 17S	1470	13	Y	1,799	MegaHaus
PO 17S	1470	13	Y	1,899	Computer Products Corp
Micropolis					
MC1548	1745	14	N	1,999	DC Drives
MC1548	1745	14	N	2,029	MegaHaus
MC1548	1745	14	N	2,049	Storage Devices Inc.
MC1548	1745	14	N	2,358	Upgrades International
MC1548	1745	14	N	2,369	Hard Drives Int'l
Fujitsu					
FJ2652	1750	11	N	2,499	Hard Drives Int'l
FJ2652	1750	11	N	2,538	Quick Electronics
FJ2652	1750	11	N	2,539	MegaHaus
FJ2652	1750	11	N	2,589	Upgrades International
Micropolis					
MC1924	2070	11	N	2,799	DC Drives
MC1924	2070	11	N	2,819	MegaHaus
MC1924	2070	11	N	2,999	Hard Drives Int'l
Seagate					
ST42000	2100	11	N	2,650	Computer Products Corp
ST42400	2100	11	Y	2,850	Computer Products Corp
ST42400	2100	11	N	3,485	Upgrades International
Hewlett Packard					
HP3010	2300	11	N	2,999	Hard Drive SuperSource
HP3010	2300	11	N	3,079	DC Drives
HP3010	2300	11	Y	3,219	DC Drives

FLOPPY DISK DRIVES

MAKE/ MODEL	MOUNT- ING	STREET PRICE	DEALER
Dual			
Canon	i	$124	Discount Micro
Canon	i	139	Aberdeen
Canon	i	139	CMO
Canon	i	139	ComputAbility
Teac	i	129	Discount Micro
Teac	i	135	Essence Group
Teac	i	145	IDER
Teac	i	145	Insight
Teac	i	149	Harmony Computer
Teac	i	154.95	Lyco Computer
3.5/1.44Mb			
Chinon	i	47	Treasure Chest
Chinon	i	49	Nationwide Computer
Chinon	i	49.95	Lyco Computer
Epson	i	51	Friday's
Epson	i	52	Aberdeen
Mitsumi	i	44	PC Importers
Mitsumi	i	47	Amka Computer
Mitsumi	i	49	CMO
Mitsumi	i	52	IDER
Mitsumi	i	53	Jade Computer
Sony	i	57	Friday's
Teac	i	52	Amka, Inc.
Teac	i	53	Nationwide Computer
Teac	i	54	GEMS Computers
Teac	i	54	Telemart
Teac	i	55	Essence Group
Teac	i	55	Jade Computer
Teac	i	56	Friday's
Teac	i	59	CMO
Teac	i	65	Ralin Wholesalers
Toshiba	i	55.95	Lyco Computer
Toshiba	i	58	Telemart
Toshiba	i	69	MidWest Computer Works
3.5/2.88Mb			
Chinon	i	89	Treasure Chest
Epson	i	169	Ralin Wholesalers
Teac	i	84.95	Lyco Computer
Teac	i	90	Essence Group
Teac	i	$99	GEMS Computers
Teac	i	129	DC Drives
Teac	i	175	IDER
3.5/720K			
Sony	i	74	Harmony Computer
Teac	i	59	DC Drives
Teac	i	59	Insight
5.25/1.2Mb			
Chinon	i	49	Treasure Chest
Chinon	i	49.95	Lyco Computer
Chinon	i	54	Nationwide Computer
Epson	i	56	Aberdeen
Epson	i	60	Friday's
Mitsumi	i	48	PC Importers
Mitsumi	i	50	Amka Computer
Mitsumi	i	51	CMO
Mitsumi	i	53	IDER
Mitsumi	i	56	Jade Computer
Teac	i	54	Telemart
Teac	i	57	IDER
Teac	i	58	Essence Group
Teac	i	58	Nationwide Computer
Teac	i	59	CMO
Teac	i	63	Friday's
Teac	i	65	Jade Computer
Teac	i	65	Ralin Wholesalers
Toshiba	i	59	Telemart
Toshiba	i	59.95	Lyco Computer
Toshiba	i	69	MidWest Computer Works
5.25/360K			
Chinon	i	46	Nationwide Computer
Teac	i	57	DC Drives
Teac	i	58	Telemart
Teac	i	59	Insight
Toshiba	i	74	Harmony Computer

I = Internal   For dealer addresses and phone numbers see page 88

MONITORS: MULTISYNC, SVGA, VGA

MULTISYNC MONITORS

MAKE/ MODEL	STREET PRICE	LIST PRICE	DEALER
Cornerstone			
Dual 120 16	$2,289	$3,799	Publishing Perfection
Dual Mono	1,815	3,099	Publishing Perfection
Page XL Mono	912	1,495	Publishing Perfection
IDEK			
MF 5117	919	2,599	MidWest Computer Works
MF 5217	899	2,599	CAD & Graphics
MF 5217	998	2,599	Hi Tech USA
MF 5217	1,049	2,599	MidWest Computer Works
Magnavox			
20CM64	1,299	2,599	Computer Discount Whse.
20CM64	1,299	2,599	Peripheral Express
CM 9217	795.58	999	Computer Discount Whse.
CM 9217	799	999	MidWest Micro
CM 9217	865	999	Peripheral Express
Mitsubishi			
HL 6955	1,779	2,150	Arlington Computer
HL 6955	1,779	2,150	Kenosha Computer
HL 6955	1,849	2,150	MidWest Computer Works
NEC			
MS 2A	375	499	Telemart
MS 2A	396	499	Cost+Plus
MS 2A	399	499	USA Flex
MS 3FGX	619.50	799	Computer Discount Whse.
MS 3FGX	629	799	Harmony Computers
MS 3FGX	638	799	Cost+Plus
MS 3FGX	679.99	799	PCs Compleat
MS 4D	569	899	MidWest Micro
MS 4D	599	899	Harmony Computers
MS 4FG	729	949	Arlington Computer
MS 4FG	739	949	Computer Discount Whse.
MS 4FG	739	949	Harmony Computers
MS 4FG	749	949	CMO
MS 4FG	769	949	MidWest Micro
MS 4FG	799.99	949	PCs Compleat
MS 5D	1,529.16	2,699	Computer Discount Whse.
MS 5D	1,549	2,699	Arlington Computer
MS 5FG	1,259	1,699	Harmony Computers
MS 5FG	1,265.93	1,699	Computer Discount Whse.
MS 5FG	1,359	1,699	CMO
MS 5FG	1,359.99	1,699	PCs Compleat
MS 5FG	1,365	1,699	Telemart
MS 5FG	$1,399	$1,699	LP Graphics
MS 6FG	2,269.57	3,499	Computer Discount Whse.
MS 6FG	2,299	3,499	CMO
MS 6FG	2,325	3,499	Telemart
MS 6FG	2,459.99	3,499	PCs Compleat
MS 6FG	2,595	3,499	LP Graphics
MS XL	899	1,999	USA Flex
Nanao			
9080i	922	1,889	Hi Tech USA
9080i	995	1,889	Compu$ave
9080i	1,025	1,889	Bulldog Computer
9080i	1,099	1,889	MidWest Computer Works
F550i	1,029	1,899	Telemart
F550i	1,068	1,899	Hi Tech USA
F550i	1,099	1,899	Microcomputer Concepts
F550i	1,118	1,899	CAD & Graphics
F550i	1,123	1,899	MidWest Computer Works
F550i	1,124	1,899	LP Graphics
T560i	1,845	2,699	CAD & Graphics
T560i	1,845	2,699	LP Graphics
T560i	1,899	2,699	Bulldog Computer
T560i	1,999	2,699	MidWest Computer Works
T660i	2,495	3,499	CAD & Graphics
Samsung			
SyncMaster 15	479	999	Arlington Computer
SyncMaster 15	479	999	Kenosha Computer
SyncMaster 2	249	499	Arlington Computer
SyncMaster 2	249	499	Kenosha Computer
SyncMaster 2	249	499	USA Flex
SyncMaster 3	279.95	599	TriState Computer
SyncMaster 3	299	599	Kenosha Computer
SyncMaster 3	299	599	USA Flex
SyncMaster 3n	349	699	USA Flex
SyncMaster 3n	369.95	699	TriState Computer
SyncMaster 3n	399	699	MidWest Computer Works
SyncMaster 4	769	1,299	Arlington Computer
SyncMaster 4	775	1,299	Pacific Wave
SyncMaster 4	799	1,299	Kenosha Computer
SyncMaster 4	799	1,299	USA Flex
Seiko			
CM 2050	1,789	2,999	MidWest Computer Works
CM 2050	1,795	2,999	Cost+Plus
CM 2070	2,199	3,599	UWE Companies

For dealer addresses and phone numbers see page 88

MAKE/ MODEL	STREET PRICE	LIST PRICE	DEALER
Sigma Designs			
L'View	$1586	$1,999	Publishing Perfection
SilverView	1,765	2,199	Publishing Perfection
Sony			
1304S	575	1,095	Prestige Computer
1304S	579.95	1,095	TriState Computer
1304S	585	1,095	Jade Computer
1304S	589.60	1,095	Computer Discount Whse.
1304S	590	1,095	Harmony Computers
1304S	612	1,095	Telemart
1604S	985	1,795	Jade Computer
1604S	1,049	1,795	USA Flex
1604S	1,095	1,795	Prestige Computer
ViewSonic			
View 6E	332	599	Essence Group
View 6E	396	599	Insight
View 6E	409	599	LP Graphics
View 6FS	575	799	Essence Group
View 6FS	629	799	Bulldog Computer
View 6FS	639	799	Discount Micro
View 6FS	653	799	Aberdeen
View 7	999	1399	Harmony Computers
View 7	999	1399	MidWest Micro
View 7	1,039	1,399	Discount Micro
View 7	1,069	1,399	Bulldog Computer
View 7	1,099	1,399	Treasure Chest
View 8	1,558	2,999	Hi Tech USA
View 8	1,589	2,999	Treasure Chest
View 8	1,649	2,999	Discount Micro
View 8	1,685	2,999	Prestige Computer
View 8	1,799	2,999	Insight

SVGA MONITORS

MAKE/ MODEL	STREET PRICE	LIST PRICE	DEALER
CTX			
1760	815	1,199	Bulldog Computer
1760	829	1,199	Peripheral Express
1760	829	1,199	USA Flex
5439	229	369	Bulldog Computer
5439	240	369	Essence Group
5439	245	369	ComputAbility
5468	260	449	Asean Computer
5468	269	449	Peripheral Express
5468	279	449	USA Flex
5468	282	449	Essence Group
5468	289	449	Bulldog Computer
Hitachi			
CM2085	1,348	2,299	Hi Tech USA
CM2085	1,389	2,299	Microcomputer Concepts
IBM			
8518	492	749	Global Horizons
8518	499	749	Pacific Wave
Panasonic			
C1381	317.99	699	S&W Computers
C1381	319	699	Harmony Computers
C1381	325	699	Jade Computer
C1381	329	699	Bulldog Computer
C1381	$339.76	$699	Computer Discount Whse.
C1395	415.99	899	S&W Computers
C1395	424	899	Harmony Computers
C1395	429	899	Arlington Computer
C1395	439	899	Bulldog Computer
C1991	1,539	2,695	Arlington Computer
C1991	1,559	2,695	Bulldog Computer
C1991	1,599	2,695	Pacific Wave
Seiko			
CM 1440	398	899	MidWest Computer Works
CM 1440	415	899	Cost+Plus
CM 1440	449.95	899	TriState Computer
CM 1450	409	999	Harmony Computers
CM 1450	419	999	MidWest Computer Works
CM 1450	425	999	Cost+Plus
CM 1450	519.95	999	TriState Computer
CM 1760	1,045.15	2,599	Computer Discount Whse.
CM 1760	1,199	2,599	UWE Companies
CM 1760	1,299	2,599	LP Graphics
ViewSonic			
View 5E	409	799	Treasure Chest
View 5E	419	799	Discount Micro
View 5E	429	799	MidWest Micro
View 5+	518	999	Hi Tech USA
View 5+	529	999	Discount Micro
View 5+	569	999	Insight
View 6	340	699	Essence Group
View 6	345	699	Elco Computers
View 6	358	699	Prestige Computer
View 6	369	699	Bulldog Computer
View 6	379	699	Aberdeen Computers

VGA MONITORS

MAKE/ MODEL	STREET PRICE	LIST PRICE	DEALER
CTX			
5468NI	290	509	Asean Computer
5468NI	309	509	USA Flex
5468NI	315	509	Essence Group
5468NI	329	509	Bulldog Computer
BM			
8515	560	950	Pacific Wave
8515	584	950	Globe Horizons
IDEK			
MF 5317	1,095	2,799	CAD & Graphics
MF 5321	2,145	2,799	CAD & Graphics
Magnavox			
7BM749	112	229	Peripheral Express
7BM749	119.50	229	Computer Discount Whse.
Samsung			
ML4571	119	179	USA Flex
ML4571	129	179	MidWest Computer Works
Sony			
1320	329	899	ComputAbility
1320	339	899	USA Flex
1320	349	899	Cost+Plus
1320	349.95	899	TriState Computer

MEMORY UPGRADE

TYPE/ CAPACITY	SPEED (ns)	PRICE	DEALER
SIMM			
1 x 3	70	$33	CMO
1 x 3	70	35	Memory Express
1 x 3	70	34.95	IDER
1 x 8	70	33	Storage Devices Inc.
1 x 8	70	33.75	C.M.S.
1 x 8	80	30	Chiptek
1 x 8	80	32	Storage Devices Inc.
1 x 8	80	32	Micro Source
1 x 8	80	33	C.M.S.
1 x 8	80	33	Memory Express
1 x 9	60	32	Chiptek
1 x 9	60	34	Storage Devices Inc.
1 x 9	60	35	Access Computer Comp.
1 x 9	60	36	C.M.S.
1 x 9	60	39	L.A. Trade
1 x 9	70	30	Access Computer Comp.
1 x 9	70	31	Chiptek
1 x 9	70	32	Elkco
1 x 9	70	34	Micro Source
1 x 9	70	35	C.M.S.
1 x 9	80	31	Storage Devices Inc.
1 x 9	80	32	Micro Source
1 x 9	80	31.50	Elkco
1 x 9	80	33	Access Computer Comp.
1 x 9	80	35	C.M.S.
4 x 8	70	109	Chiptek
4 x 8	70	119	Memory Express
4 x 8	70	125	C.M.S.
4 x 8	80	111	Storage Devices Inc.
4 x 8	80	122	C.M.S.
4 x 9	60	125	Elkco
4 x 9	60	129	Chiptek
4 x 9	60	138	C.M.S.
4 x 9	60	139	Micro Source
4 x 9	60	145	CMO
4 x 9	70	115	Elkco
4 x 9	70	119	Chiptek
4 x 9	70	120	Access Computer Comp.
4 x 9	70	128	C.M.S.
4 x 9	70	129	Memory Express
4 x 9	80	118	Chiptek
4 x 9	80	125	Storage Devices Inc.
4 x 9	80	127	C.M.S.
4 x 9	80	129	Micro Source
4 x 9	80	$134	L.A. Trade
4 x 9	80	144	Loma
256 x 9	70	10.50	Elkco
256 x 9	70	11	Chiptek
256 x 9	70	12	Micro Source
256 x 9	70	13.95	IDER
256 x 9	80	12	Memory Express
256 x 9	80	15	Loma
256 x 9	80	18	L.A. Trade
SIPP			
1 x 8	80	31	Chiptek
1 x 8	80	33	Storage Devices Inc.
1 x 9	60	33	Chiptek
1 x 9	60	35	Storage Devices Inc.
1 x 9	60	44	L.A. Trade
1 x 9	60	49.99	Hard Drive Super Source
1 x 9	70	32	Chiptek
1 x 9	70	33	Storage Devices Inc.
1 x 9	70	33	Elkco
1 x 9	70	43	L.A. Trade
1 x 9	70	44	Loma
1 x 9	70	48.99	Hard Drive Super Source
1 x 9	80	32	Storage Devices Inc.
1 x 9	80	32	Chiptek
1 x 9	80	32.50	Elkco
1 x 9	80	42	Loma
1 x 9	80	42	L.A. Trade
4 x 9	60	130	Chiptek
4 x 9	60	131	Elkco
4 x 9	60	169	L.A. Trade
4 x 9	70	120	Chiptek
4 x 9	70	122.50	Elkco
4 x 9	70	135	Storage Devices Inc.
4 x 9	70	143	L.A. Trade
4 x 9	70	146	Loma
4 x 9	80	119	Chiptek
4 x 9	80	126	Storage Devices Inc.
4 x 9	80	139	L.A. Trade
4 x 9	80	144	Loma
256 x 9	70	11.75	Elkco
256 x 9	70	12	Chiptek
256 x 9	70	13	Storage Devices Inc.
256 x 9	70	17	Loma

For dealer addresses and phone numbers see page 88

SOFTWARE

UTILITY PROGRAMS

MANUFACTURER/ PRODUCT	STREET PRICE	LIST PRICE	DEALER
Abbott Systems			
CanOpener (Mac)	$59	$99	Mac Connection
CanOpener (Mac)	62	99	Mac's Place
Above Software			
Above Disk (PC)	54	120	Software Add Ons
Above Disk (PC)	59	120	StarWare
AddStor			
SuperStor (PC)	69	139	MicroWarehouse
SuperStor (PC)	79.95	139	ComputAbility
SuperStor (PC)	85	139	PC Connection
Attitash Software			
AttiTools (PC)	59	129.95	MicroWarehouse
AttiTools (PC)	59	129.95	PC Connection
Dragnet (PC)	32	79	MicroWarehouse
Dragnet (PC)	34	79	PC Zone
WideAngle (PC)	59	129	FastMicro
WideAngle (PC)	59	129	MicroWarehouse
WideAngle (PC)	59	129	PC Connection
Berkeley Systems			
AfterDark (PC)	28.95	49.95	ComputAbility
AfterDark (PC)	29	49.95	Hunter
AfterDark (Mac)	29	49.95	Mac's Place
AfterDark (Mac)	30	49.95	Publisher's Toolbox
Bourbaki			
1 Dir+ (PC)	44	95	SoftComp USA
1 Dir+ (PC)	49	95	Loma Computer
Central Point			
AntiVirus (PC)	57.99	129	ET Valueline
AntiVirus (PC)	85	129	MicroWarehouse
AntiVirus (PC)	89	129	Loma Computer
Copy II PC (PC)	29	69.95	Cost+Plus
Copy II PC (PC)	35	69.96	Telemart
Copy II PC (PC)	39	69.96	Dustin Discount
PC Tools (PC)	94	179	Software Unlimited
PC Tools (PC)	99	179	StarWare
PC Tools (PC)	115	179	CallSoft
PC Tools (PC)	119	179	MicroWarehouse
Dariana Technology			
SystemSleuth Pro (PC)	82	149	PC Zone
SystemSleuth Pro (PC)	99	149	CompuClassics
SystemSleuth Pro (PC)	105	149	MicroWarehouse
WinSleuth (PC)	95	149	Software Add Ons
WinSleuth (PC)	99	149	Publisher's Toolbox
WinSleuth (PC)	105	149	MicroWarehouse

MANUFACTURER/ PRODUCT	STREET PRICE	LIST PRICE	DEALER
DataViz			
MacLink+ (Mac)	$128	$179	Mac's Place
MacLink+ (Mac)	128	179	Publisher's Toolbox
MacLink+ (Mac)	129	179	Mac Connection
Farallon			
Timbuktu (Mac)	128	179	Mac's Place
Timbuktu (Mac)	129	179	Mac Connection
Fifth Generation			
Direct Access (PC)	59	99	SoftDirect
Direct Access (PC)	59.95	99	ComputAbility
Direct Access (PC)	61	99	Telemart
Direct Access (PC)	62	99	Hunter
FastBack+ (PC)	109	189.95	Dustin Discount
FastBack+ (PC)	112.95	189.95	ComputAbility
FastBack+ (PC)	115	189.95	StarWare
Funk Software			
Allways 1.2 (PC)	109	195	Software Add Ons
Allways 1.2 (PC)	115	195	Software Unlimited
Sideways 3.3 (PC)	54	69.95	Software Unlimited
Sideways 3.3 (PC)	54	69.95	Telemart
Sideways 3.3 (PC)	55	69.95	FastMicro
Sideways 3.3 (PC)	55	69.95	StarWare
Gazelle			
OPtune (PC)	42	99.95	Telemart
OPtune (PC)	49	99.95	Software Unlimited
OPtune (PC)	57	99.95	Software Add Ons
Gibson Research			
SpinRite II (PC)	52.95	89	ComputAbility
SpinRite II (PC)	55	89	Insight Software
SpinRite II (PC)	59	89	Cost+Plus
SpinRite II (PC)	63	89	Loma Computer
Gold Disc			
ScreenCraze (PC)	25	49.95	MicroWarehouse
ScreenCraze (PC)	28	49.95	PC Zone
Helix			
NetRoom (PC)	52	79.95	PC Connection
NetRoom (PC)	59	79.95	MicroWarehouse
NetRoom (PC)	59	79.95	StarWare
Hewlett Packard			
Dashboard (PC)	32	95	PC Connection
Dashboard (PC)	46	95	PC Zone
Dashboard (PC)	69	95	MicroWarehouse
ICOM Simulations			
Intermission (PC)	27	49.95	Telemart
Intermission (PC)	29	49.95	PC Connection
Intermission (Mac)	32	49.95	Mac's Place
Intermission (PC)	33	49.95	Cost+Plus

For dealer addresses and phone numbers see page 88

MANUFACTURER/ PRODUCT	STREET PRICE	LIST PRICE	DEALER
Integrated Information			
XtraDrive (PC)	$58	$99	PC Zone
XtraDrive (PC)	59	99	MicroWarehouse
Laser Tools			
PrintCache (PC)	87.95	129	ComputAbility
PrintCache (PC)	98	129	Publishing Perfection
LaserGo			
GoScript (PC)	88	149	SoftComp USA
GoScript (PC)	89	149	Software Add Ons
Magee Enterprises			
AutoMenu 4.5 (PC)	35	69.95	Telemart
AutoMenu 4.5 (PC)	39	69.95	StarWare
Metro ImageBase			
LaserTwin (PC)	117	179	Publishing Perfection
LaserTwin (PC)	115	179	MicroWarehouse
MicroCom			
Virex (Mac)	72	129	Mac's Place
Virex PC (PC)	72	99.95	MicroWarehouse
Virex PC (PC)	73	129	SoftComp USA
Novell			
NetWare Lite (PC)	69	139	PC Connection
NetWare Lite (PC)	74	139	MicroWarehouse
Okna Corporation			
DeskTop Set (PC)	49	149	PC Connection
DeskTop Set (PC)	49	149	Publishing Perfection
Personics			
Laplink Ultravision (PC)	59.95	89	ComputAbility
Laptop Ultravision (PC)	59	89	PC Connection
UltraVision (PC)	59	129	PC Connection
UltraVision (PC)	77	129	StarWare
Polaris			
PackRat (PC)	229.95	395	ComputAbility
PackRat (PC)	259	395	MicroWarehouse
QMS			
UltraScript PC (PC)	118	295	Publishing Perfection
UltraScript PC (PC)	119	295	StarWare
UltraScript PC+ (PC)	232	445	Software Add Ons
UltraScript PC+ (PC)	259	445	Publishing Perfection
UltraScript PC+ (PC)	263	445	Publisher's Toolbox
Qualitas			
386 Max (PC)	61	99.95	MicroWarehouse
386 Max (PC)	63	99.95	Software Add Ons
386 Max (PC)	64	99.95	Software Unlimited
Blue Max (PC)	79	124.95	MicroWarehouse
Blue Max (PC)	79	124.95	PC Connection
Blue Max (PC)	87	124.95	StarWare
Quarterdeck			
DESQview 386 (PC)	127	220	Software Add Ons
DESQview 386 (PC)	129	220	MicroWarehouse
DESQview 386 (PC)	139	220	Dustin Discount
DESQview II (PC)	58	129.95	Dustin Discount
DESQview II (PC)	75	129.95	FastMicro
DESQview II (PC)	77	129.95	Software Add Ons
QEMM 386 (PC)	57	99.95	USA Flex
QEMM 386 (PC)	59	99.95	Cost+Plus
QEMM 386 (PC)	62	99.95	CompuClassics
QRAM (PC)	$49	$79	Loma Computer
QRAM (PC)	49	79	MicroWarehouse
QRAM (PC)	49	79	StarWare
Revolution Software			
VGA Dimmer (PC)	24	79	StarWare
VGA Dimmer (PC)	25	79	Software Unlimited
SoftLogic Solutions			
Software Carousel (PC)	53	89.95	Telemart
Software Carousel (PC)	57	89.95	Software Add Ons
Software Directions			
PrintQ (PC)	79	149	Telemart
PrintQ (PC)	85	149	Software Add Ons
PrintQ (PC)	86	149	Loma Computer
PrintQ (PC)	99	149	Dustin Discount
Stac Electronics			
Stacker (PC)	75	129	CallSoft
Stacker (PC)	92	129	StarWare
Stacker (PC)	95	129	PC Connection
Symantec			
Norton AntiVirus (PC)	81.95	129	ComputAbility
Norton AntiVirus (PC)	83	129	Action Computer
Norton AntiVirus (PC)	84	129	PC Connection
Norton AntiVirus (PC)	85	129	StarWare
Norton BackUp (PC)	85	129	FastMicro
Norton BackUp (PC)	89	129	Software Unlimited
Norton BackUp (PC)	93	129	StarWare
Norton Desktop (PC)	112	179	Cost+Plus
Norton Desktop (PC)	112.95	179	ComputAbility
Norton Desktop (PC)	115	179	PC Connection
Norton Utilities (Mac)	95	179	Mac Connection
Norton Utilities (PC)	110	179	Software Add Ons
Norton Utilities (PC)	111	179	Telemart
SAM (Mac)	59	99	Publisher's Toolbox
SAM (Mac)	64	99	Mac's Place
Systems Compatibility			
Software Bridge (PC)	69	129	StarWare
Software Bridge (PC)	79	129	Software Add Ons
Teknosys			
Help! (Mac)	89	129	Mac Connection
Help! (Mac)	89	129	Mac's Place
Touchstone Software			
Check It (PC)	77.95	149	ComputAbility
Check It (PC)	79	149	Insight Software
Check It (PC)	85	149	PC Connection
Travelling Software			
Battery Watch (PC)	30	49.95	SoftDirect
Battery Watch (PC)	32	49.95	Software Add Ons
Battery Watch (PC)	32	49.95	StarWare
XTree			
XTree Gold (PC)	88	149	Telemart
XTree Gold (PC)	95	149	StarWare
XTree Gold (PC)	99	149	Dustin Discount
Zenographics			
SuperPrint (PC)	113	195	PC Zone
SuperPrint (PC)	123	195	Publisher's Toolbox

DEALERS

Aberdeen
1125 S. Maple Ave., Unit P,
Montebello, CA 90640, Phone:
(800) 552-6868, (213) 725-3368

Access Computer Components
PO Box 797602, Dallas, TX
75379, Phone: (800) 332-3778,
(214) 380-5943

Amka, Inc.
15342-B E. Valley Blvd.,
City of Industry, CA 91746, Phone:
(818) 369-2121

Arlington Computer Products
1970 Carboy, Mt. Prospect, IL
60056, Phone: (800) 548-5105,
(708) 228-6333

Bulldog Computer Products
610 Industrial Park Dr., Evans, GA
30809, Phone: (800) 438-6039,
(404) 860-7364

CAD & Graphics
1301 Evans, San Francisco, CA
94104, Phone: (800) 288-1611,
(415) 647-9671

CMO Corporation
101 Reighard Ave., Williamsport,
PA 17701, Phone: (800) 233-8950,
(717) 327-9200

Chiptek
17300 Saturn Ln., Ste. 110,
Houston, TX 77058, Phone: (800)
775-2447, (713) 286-4376

CompuClassics
PO Box 10598, Canoga Park, CA
91309, Phone: (800) 733-3888

ComputAbility
PO Box 17882, Milwaukee, WI
53217, Phone: (800) 558-0003,
(414) 357-8181

Computer Discount Warehouse
2840 Maria, Northbrook, IL 60062,
Phone: (800) 233-4426, (708) 498-1426

Computer Products Corp.
1431 S. Cherryvale Rd., Boulder,
CO 80303, Phone: (800) 338-4273

Compu$ave
4209 S. 37th St., Dept. S8,
Phoenix, AZ 85040, Phone: (800)
544-8302, (602) 437-8298

Cost+Plus
12306 Technology Blvd., Austin,
TX 78727, Phone: (900) 289-4537

C.M.S
29 Salisbury Terr., Lecanto, FL
34461, Phone: (904) 726-4854

DC Drives
1110 NASA Rd., 1, Ste. 304,
Nassau Bay, TX 77058, Phone:
(800) 872-6007, (713) 333-9602

Discount Micro
3430 E. 7800 S., #107, Salt Lake
City, UT 84121, Phone: (800) 574-3325,
(801) 576-8683

Dustin Discount
20969 Ventura Blvd., Ste. 13,
Woodland Hills, CA 91364, Phone:
(800) 274-6611, (818) 710-9174

ET Valueline
7350 N. Linder Ave., Skokie, IL
60077, Phone: (800) 395-1000,
(708) 677-7660

Elco Computers
229 S. Raymond Ave., Alhambra,
CA 91801, Phone: (818) 284-4682

Elkco Corporation
41 Main St., North Grafton, MA
01536, Phone: (800) 24-ELKCO,
(508) 839-2111

Essence Group
17815 Newhope St., #G,
Fountain Valley, CA 92708,
Phone: (714) 546-3110, (714) 546-3110

FastMicro
4405 E. Baseline Rd., Phoenix, AZ
85044, Phone: (800) 441-3278,

Friday's
980 S. First St., San Jose, CA
95110, Phone: (800) 488-6575

GEMS
2115 Old Oakland Rd., San Jose,
CA 95131, Phone: (800) 743-9333,
(800) 743-7330

Global Electronics
3937 S. Sepulveda Blvd.,
Culver City, CA 90230, Phone:
(800) 950-4487

Hard Drive Super Source
1202 Kifer Rd., Sunnyvale, CA
94086, Phone: (800) 252-9777

Hard Drives International
1912 W. 4th St. Dept. HDU,
Tempe, AZ 85281, Phone: (800)
767-DISK, (800) 733-0882

Harmony Computers
1801 Flatbush Ave., Brooklyn, NY
11210, Phone: (800) 441-1144,
(718) 692-3232

Hi Tech USA
1562 Centre Point Dr., Milpitas,
CA 95035, Phone: (800) 831-2888,
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Hunter
10816 Fallstone Rd., Ste. 510,
Houston, TX 77099, Phone: (800)
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IDER
9080 Telstar Ave., #302,
El Monte, CA 91731, Phone: (800)
622-4337, (818) 288-4008

Insight Computers
1912 W. 4th St., Tempe, AZ
85281, Phone: (800) 776-7600,
(602) 350-1176

JB Technologies
5105 Maureen Lane, Moorpark,
CA 93021, Phone: (805) 529-0908

Jade Computer
4901 W. Rosecrans Ave.,
Hawthorne, CA 90251-5046,
Phone: (800) 421-5500, (310) 973-7707

Kenosha Computer
2133 91st St., Kenosha, WI
53140, Phone: (800) 255-2989,
(414) 697-9595

LP Graphics
4888 Stamp Rd., Marlow Heights,
MD 20748, Phone: (800) 628-4517,
(301) 899-1118

Loma Computers
946 Loma Dr., Hermosa Beach,
CA 90254, Phone: (800) 369-2846,
(213) 798-2835

Lyco Computer
PO Box 5068, Jersey Shore, PA
17740, Phone: (800) 233-8760,
(717) 494-1030

L.A. Trade
20930 S. Normandie, Torrance,
CA 90502, Phone: (800) 433-3726,
(310) 782-2880

Mac Connection
14 Mill St., Marlow, NH 03456,
Phone: (800) 800-2222

Mac's Place
8461 154th Ave. NE, Redmond, WA 98052, Phone: (800) 367-4222, (206) 883-8312

MegaHaus Drives
1110 NASA Rd., 1, Ste. 306, Houston, TX 77058, Phone: (800) 426-0560, (713) 333-1910

Memory Express
15140 Valley Blvd., City of Industry, CA 91744, Phone: (800) 877-8188

Micro Source
1422 E. Main, League City, TX 77573, Phone: (800) 645-5016, (713) 486-8373

MicroWarehouse
PO Box 3014, Lakewood, NJ 08701-3014, Phone: (800) 367-7080, (908) 370-0518

Microcomputer Concepts
15200 Transistor Lane, Huntington Beach, CA 92649, Phone: (800) 772-3914, (714) 898-3002

MidWest Computer Works
350 Lexington Dr., Buffalo Grove, IL 60089, Phone: (800) 669-5208

MidWest Micros
6910 US Rte. 36 East, Fletcher, OH 45326, Phone: (800) 423-8215,(513) 368-2650

Nationwide Computer
PO Box 7AQ, Jersey City, NJ 07307, Phone: (800) 777-1054, (201) 659-2127

PC Connection
6 Mill St., Marlow, NH 03456, Phone: (800) 243-8088, (603) 446-7721

PC Importers
4530 Emery Industrial Pkwy., Cleveland, OH 44128, Phone: (800) 886-5155

PC Zone
18005 NE 68th St., Ste., A110, Redmond, WA 98052, Phone: (800) 252-0286, (206) 883-3088

PCs Compleat
34 St. Martin Dr., Marlborough, MA 01752, Phone: (800) 669-4727

Pacific Wave
PO Box 840312, Dallas, TX 75284-0312, Phone: (800) 348-4727

Peripheral Express
PO Box 2047, Norcross, GA 30091, Phone: (800) 299-0200

Prestige Computer
3248 Stevens Creek Blvd., San Jose, CA 95117, Phone: (800) 888-6210, (408) 249-3398

Publishing Perfection
PO Box 307, Menomonee Falls, WI 53051, Phone: (800) 782-5974, (414) 255-7600

Quick ELectronics
10800 76th Court N., Largo, FL 34647, Phone: (800) 800-5500, (813) 546-9299

Ralin Wholesalers
PO Box 450, Orchard Park, NY 14127, Phone: (800) 752-9512

SoftComp USA
3701 Harbor Blvd., Ste. 211F, Santa Ana, CA 92704, Phone: (800) 922-3544, (714) 957-3325

SoftDirect
1301 John Reed Ct., City of Industry, CA 91745, Phone: (800) 800-2220, (818) 369-3873

Software Add Ons
3331 Street Rd., Ste., 155, Bensalem, PA 19020, Phone: (800) 822-8088, (215) 639-7110

Software Unlimited
2465 W. 12th St., Ste. 5, Tempe, AZ 85281, Phone: (800) 926-SOFT, (800) 926-7638

Star Ware
3174 Sunset Ave., Norristown, PA 19403, Phone: (800) 523-0702

Storage Devices, Inc.
17300 Saturn Lane, Ste. 110, Houston, TX 77058, Phone: (713) 480-2070

S&W Computers
31 W. 21st St., New York, NY 10010, Phone: (800) 874-1235, (212) 463-8330

Telemart
8804 N. 23rd Ave., Phoenix, AZ 85021, Phone: (800) 537-4735

Treasure Chest Computers (TC)
1310 Carroll St., Kenner, LA 70062, Phone: (800) 245-3040, (504) 468-2113

TriState Computer
160 Broadway, New York, NY 10038, Phone: (800) 433-5199, (212) 349-3134

USA Flex
135 N. Brandon Dr., Glen Ellyn, IL 60139, Phone: (800) USA-FLEX, (800) 872-3539

UWE Companies
601 N.. West St., #100, Wichita, Kansas 67203, Phone: (800) 442-1408

Upgrades International
10800 76th Ct. N., Largo, FL 34647, Phone: (800) 877-8047

by Jules Gilder

Practical PostScript Applications

Make Labels Quickly With This PostScript Program

If you've ever had to type or print a lot of labels with the same information on it, you know what a pain in the neck it can be. People with mailing list, forms creation or desktop publishing programs can get around the problem with these packages, but they're expensive and the solution is not as elegant as it is with this PostScript program.

Here, you only have to type the label information once and that's all. The program duplicates it and prints it out exactly where it has to be on the page. The two programs presented here are designed to work only with 8.5 x 11-inch sheets that have 33 labels on them (such as the Avery 5351 labels). One program is presented for printing labels in their standard horizontal format (such as return address labels) and the other prints labels vertically. While there are 33 labels on a sheet. we've designed the programs so that the horizontal one prints all 33 while the vertical one only prints 30, because the entire area of the top row of labels is not available.

33 Horizontal Labels

The first program prints out the horizontal labels. It starts out by defining the size of each label in points which is 72 points (1 inch) high by 204 points (2.833 inches) wide.

After the label size is defined, we define exactly what one label will look like. I've chosen a simple three-line address where everything is centered. You can choose something else. Just make sure it all fits in one label. Next we define a routine, called "print3," that will print out three labels across the page. This routine is then used to define another routine—"print6"—that prints out two rows of three. Finally, by using a combination of these two routines, an entire sheet of 33 labels is printed.

30 Vertical Labels

PostScript enables you to do something that is virtually impossible with any other program: to print information while the label is oriented in its tall mode. This is particularly handy when you need to label small objects while still providing a substantial amount of information. In this case, I produced labels for 35 mm film canisters.

Since we're using almost all of the 1-inch width of the label, if we try to print on the top row of labels, information will be lost. Hence, we only print 30 labels.

As with the earlier program, we have to define the label width and height. This time, those numbers are interchanged and the height is 204 while the width is 72. Another difference is that we now rotate the page ninety degrees so that we can print vertically on the labels.

Next, as before, the make up of a single label is described. The same "print3" and "print6" routines are defined and 30 labels are printed. ■

Thinking of buying a laser printer?

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PRINTERS
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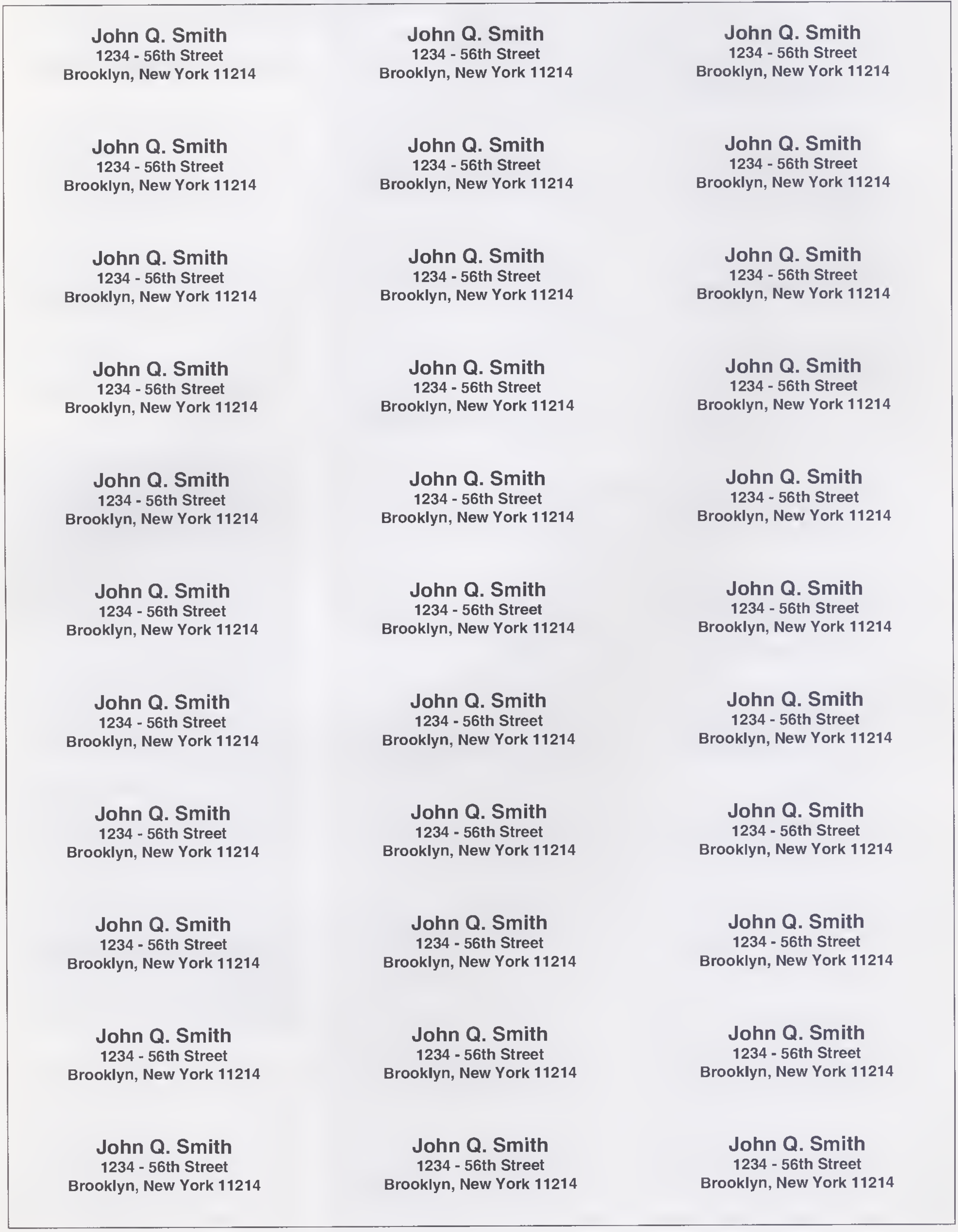
Also covers dot matrix, inkjets, thermals, and portables.

The finished product — 33 horizontal labels. Actual size of the page represented is 8.5" x 11". Program listing is on page 108.



```
     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214

     John Q. Smith                 John Q. Smith                 John Q. Smith
   1234 - 56th Street            1234 - 56th Street            1234 - 56th Street
Brooklyn, New York 11214      Brooklyn, New York 11214      Brooklyn, New York 11214
```

PostScript Program Listing — 33 Horizontal Labels

```
% This program will print out a
sheet of 30 labels, each
% measuring 2.833 by 1 inches


% Define the size of the label.

 72 204
 /width exch def
 /height exch def

% Routine to produce one label.

/onelabel {

    %  LABEL
    %
    /center {dup stringwidth pop
2 div neg 0 rmoveto} bind def

     /Helvetica-Bold findfont 13
scalefont setfont
    102 48 moveto
    (John Q. Smith) center show
     /Helvetica-Bold findfont 10
scalefont setfont
    102 36 moveto
     (1234 - 56th Street) center
show
    102 24 moveto
   (Brooklyn, New York 11214)
center show
    } def


% Position the label

0 0 moveto

% Print one row of three labels

/print3 {
     save onelabel restore
    save width 0 translate onelabel
restore
     save 2 width mul 0 translate
onelabel restore
     } def

% Print 6 labels by printing two
rows of three

/print6 {
     print3
     save 0 height translate print3
restore
     } def

% Print an entire sheet of 33 labels
and eject page.

print6
save 0 2 height mul translate print6
restore
save 0 4 height mul translate print6
restore
save 0 6 height mul translate print6
restore
save 0 8 height mul translate print6
restore
save 0 10 height mul translate
print3 restore

showpage
```

Use PostScript to Make

Extra Bold Fonts

One of the big advantages of PostScript is that it is so flexible. One confirmation of its flexibility is its ability to let you modify and customize fonts. Let's say, for example, that you would like to have an Extra Bold Times Roman font. You might find it difficult, expensive and inconvenient to go out and purchase such a font. It would also be foolish: with just a few lines of PostScript code, you can create its equivalent. The listing is shown below.

— Program Listing —
Extra Bold Font

```
/font {findfont exch scalefont
     setfont} bind def
/kerning 2 def
/thickness 12 def
/offset .24 def
60/Times-Bold font
/extrabold {gsave /text exch def
currentpoint translate thickness
  {0 0 moveto kerning 0 text ashow
offset 0 translate} repeat
   grestore} def
100 100 moveto (Bold Font) show
100 200 moveto (Extra Bold Font)
extrabold
showpage
```

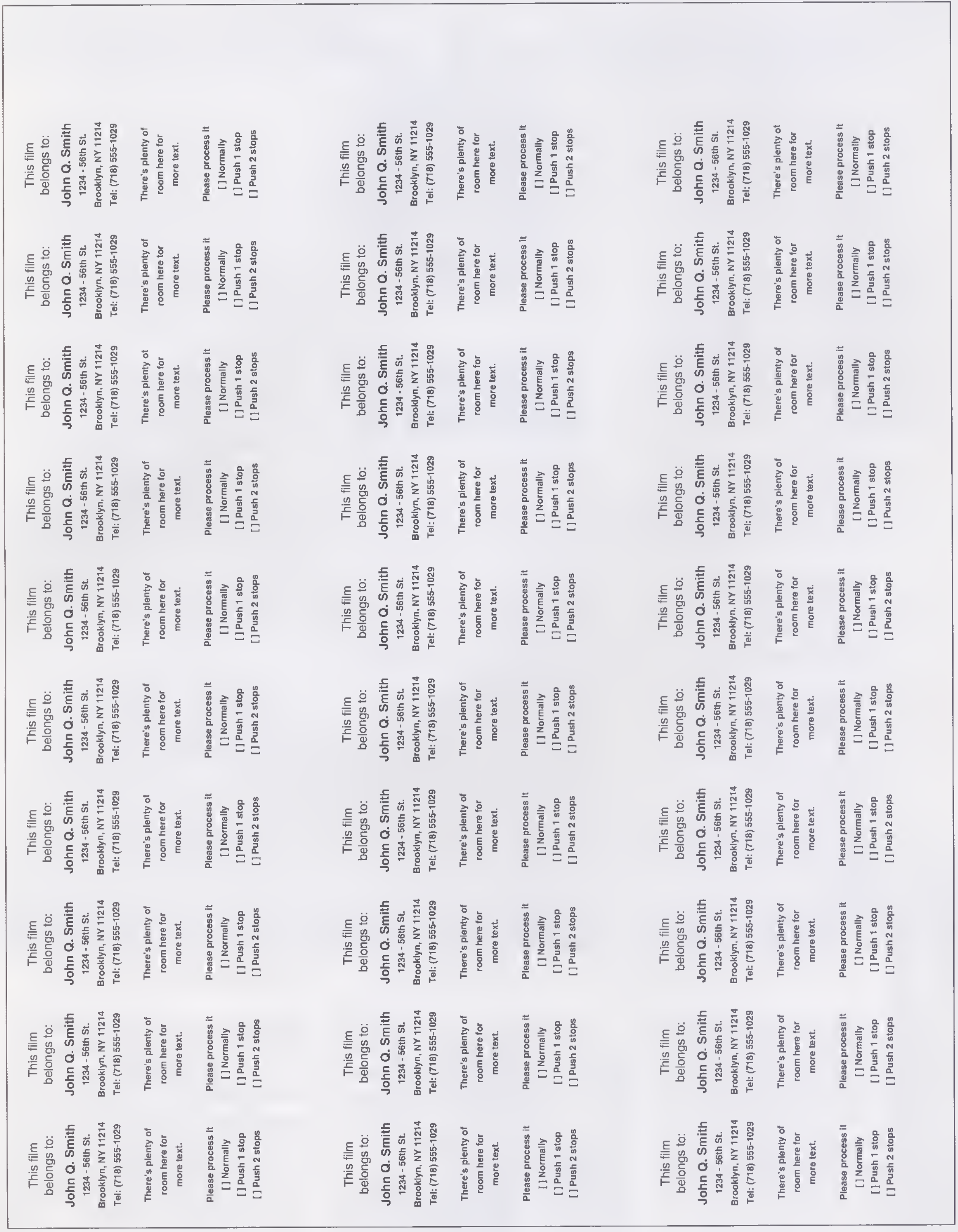
What you get —

Extra Bold Font

Bold Font

The technique used to create an Extra Bold font is the same one used by typewriters to create a bold font: The character is printed, the cursor returns to the original position plus a small offset and the character is printed again. The size of the offset

The finished product — 30 vertical labels. Actual size of the page represented is 8.5" x 11". Progam listing is on page 110.



This film
belongs to:
John Q. Smith
1234 - 56th St.
Brooklyn, NY 11214
Tel: (718) 555-1029

There's plenty of
room here for
more text.

Please process it
[ ] Normally
[ ] Push 1 stop
[ ] Push 2 stops

This film
belongs to:
John Q. Smith
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Brooklyn, NY 11214
Tel: (718) 555-1029

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Please process it
[ ] Normally
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[ ] Push 2 stops

PostScript Program Listing — 30 Vertical Labels

```
% This program will print out a
sheet of 30 labels, each
% measuring 2.833 by 1 inches

% Define the size of the label.

 204 72
 /width exch def
 /height exch def

% Routine to produce one label.

/onelabel {

    %   LABEL
    %
    /center {dup stringwidth pop
2 div neg 0 rmoveto} bind def

   /Helvetica findfont 8 scalefont
setfont
    36 184 moveto
    (This film) center show
    36 174 moveto
    (belongs to:) center show
    36 160 moveto
      /Helvetica-Bold findfont 8
scalefont setfont
    (John Q. Smith) center show
    36 150 moveto
      /Helvetica-Bold findfont 6
scalefont setfont
    (1234 - 56th St.) center show
    36 140 moveto
    (Brooklyn, NY 11214) center
show
    36 130 moveto
    (Tel: (718) 555-1029) center
show
    36 120 moveto
    ()center show
    36 110 moveto
   (There's plenty of)center show
    36 100 moveto
    (room here for)center show
    36 90 moveto
    (more text.)center show
    36 80 moveto
    () center show
    36 70 moveto
   (Please process it) center show
    36 60 moveto
    ([ ] Normally) center show
    36 50 moveto
      /Helvetica-Bold findfont 6
scalefont setfont
    ([ ] Push 1 stop) center show
    36 40 moveto
    ([ ] Push 2 stops) center show
    } def


% Position the label

    612 0 translate
    90 rotate
    5 0 translate
    0 0 moveto

% Print one row of three labels

/print3 {
      save onelabel restore
         save 0 height translate
onelabel restore
      save 0 2 height mul translate
onelabel restore
      } def

% Print 6 labels by printing two
rows of three

/print6 {
      print3
      save width 0 translate print3
restore
      } def

% Print an entire sheet of 33 labels
and eject page.

print6
save 2 width mul 0 translate print6
restore
save 4 width mul 0 translate print6
restore
save 6 width mul 0 translate print6
restore
save 8 width mul 0 translate print6
restore

showpage
```

will determine how smooth the new bolder character will look and the number of times you repeat this operation will determine how bold the character will be. The more repetitions, the bolder the character. These two characteristics are defined in the listing as "offset" and "thickness" respectively.

One problem arises as you make letters thicker: you need to adjust the inter-letter spacing (also known as kerning). We take care of that with a variable called "kerning". Increasing the value of kerning puts more space between letters.

To use the Extra Bold capability in another program, simply include the listing (minus the last three lines which print out a test sample) in your program and use the new command **extrabold** instead of **show** when you want to print something in an extra bold face. Although the Times-Bold font was used here for an example, you can, of course, use any font you wish. ■

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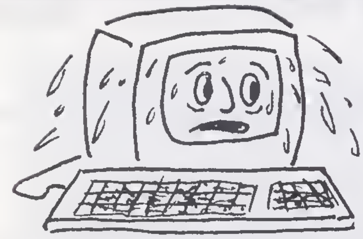

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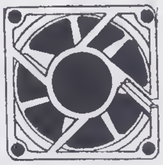

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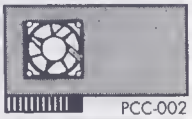

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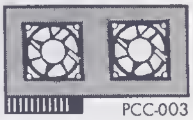

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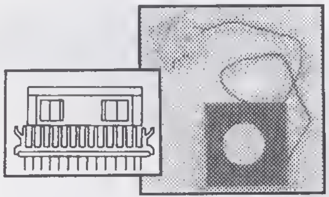

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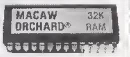

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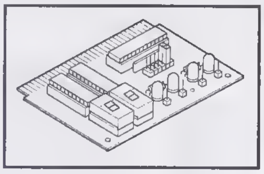

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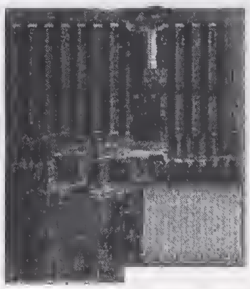

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